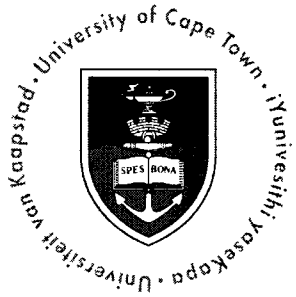
Assessing the African Mobile Telephony Boom

the impact of the mobile phone and its relationship to the digital divide

by Alex Comninos



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Abstract

This dissertation provides an overview of the boom in mobile telephony in Africa, experienced in terms of exceptional and increasing subscriber growth. It provides a description of the mobile telephony boom, as well as its social political and economic impacts. It investigates what effect mobile telephony has had on the bridging of a broader *digital divide,* conceived of in terms of inequalities in access to information and communication technologies between Africa and the rest of the world, as well within Africa itself. It concludes that the boom in mobile telephony has had far-reaching impacts on the continent at all levels of African society. In particular, mobile phones have had a significant economic impact on the continent, which the author argues has been from the bottom up – affecting greatly the base of the economic pyramid and the informal sector. Mobile telephony has however not made a significant impact in the bridging of the digital divide conceived of in terms of access to the internet. A broader digital divide still exists which mobile telephony may not provide the tools to bridge.

Acknowledgements

This dissertation would not have been possible if it were not for a number of people. I thank kindly the UCT Department of Political Studies, notably my supervisor, Professor Robert Schrire. I am grateful to Prof Schrire for his guidance, allowing me the space to write a dissertation that does not deal with the conventional subject matters of international relations. I thank Alison Gilwald of the LINK Centre, Philip Kruger of Vodacom Regulatory Affairs, and Debbie Millar of MTN Corporate Affairs – for allowing me to conduct interviews, and for their invaluable insights. Lastly, this dissertation would not have been possible without the support (financial and emotional) of my parents, to whom I am eternally thankful.

Contents

Introduction

Despite the rapid pace of technological change throughout the global telecommunications and information ages of the 20th century, a large divide between those with access to technology-driven networks of information and communication and those without has existed between Africa and the rest of the world, as well as within Africa itself. One component of this divide – the divide between those with and those without access to telephony – has been radically narrowed by the introduction of mobile telephony. More telephone connections (both fixed-lines and mobile phones) have been installed in Africa in the first few years of the 21st century than in the entire 20th century. For the whole of the 20th century, access to telephony was the reserve of a tiny percentage of the population – mostly wealthy and urban. The ratio telephones to people in Africa only began to approach 1:100 in 2000.[1] However, by the end of 2007, the ratio of mobile phones to people may have been around 28:100.[2] Telephony is no longer a phenomenon limited to urban economic elites; but rather forms part of everyday life for a large proportion of the African population.

In the past decade, Africa has experienced a boom in mobile telephony involving phenomenal growth in subscribers as well as in revenues for mobile operators, governments and ancillary industries. The rates of subscriber growth are arguably unprecedented in the history telecommunications rollout. This growth is having far-reaching social, political and economic effects through international, continental, regional, national, sub-national and local levels. Many see this revolution as heralding a greater set of processes occurring on the

[1] Telecommunication Development Bureau, *African Telecommunication Indicators 2001* (Geneva: International Telecommunication Union 2001), 2.

[2] This is calculated according to projections for subscribership at year-end 2007 and using a population estimate of 941 million. (International Telecommunication Union, "USD 55 billion committed to connect Africa", International Telecommunication Union (Press Release), 31 October 2007, <http://www.itu.int/newsroom/press_releases/2007/34.html>.

continent – tantamount to a closing of a digital divide between Africa and the rest of the world, and the integration of Africa into an emerging informational society and informational mode of capitalism and development.

How deep are the effects of mobile telephony? What effects have mobile phones had on Africa's social, political and economic development? Have mobile phones contributed towards a narrowing of a digital divide between Africa and the rest of the world? Has the mobile phone helped integrate Africa into the global information society? What are the possibilities for mobile telephony to fulfil these roles? This dissertation shall investigate these possibilities.

It must be noted that this boom in is taking place on a continent which *still* has the lowest ratios of Information and Communications Technologies (ICTs) to population, as well as the lowest ratio of income to population of any region in the world. Have mobile phones helped to bridge these divides? According to *The Economist*, "encouraging the spread of mobile phones is the most sensible and effective response to the digital divide."[3] Can mobile phones play a developmental role and help to narrow a more important income divide between Africa and the developed world? According to Ernest Ndukwe, vice chairman of the Nigerian Communications Commission, mobile phones can provide "the launchpad for African countries toward the process of to information societies and knowledge economies."[4] In order for this to happen, certain technological gaps between Africa and the rest of the world will have to be bridged. However, according to *African Business* magazine, through the use of mobile phones "the dream of Africa catching up technologically with the industrialised world by skipping phases of technological development seems to be coming true."[5] Do mobile

[3] *The Economist*, "The real digital divide", 12 March 2005, 11.
[4] *People's Daily* (Beijing), "Poor Africa witnesses great leap in mobile industry", 23 June 2005 <http://english.people.com/200506/23/print20050623_1981876.html>.
[5] Neil Ford, "Mobiles boost economic growth", *African Business*, May 2006, 40.

phones provide the opportunity for Africa to skip certain phases of technological development; and thus, by implication accelerate the pace of technological development?

This dissertation investigates the possibilities for mobile telephony to fulfil these roles. It will describe the extent of the boom in mobile telephony (measured in terms of subscriber growth and increases in access to mobile technology), as well as the qualities of this boom, and its social effects. It shall also investigate this boom in the broader contexts of both an African *information revolution,* and the digital divides that exist between Africa and the rest of the world, as well as within Africa itself. It will ask to what extent the revolution in African mobile telephony is part of a larger information revolution on the continent; and to what extent it has contributed to a narrowing of these divides. Once these questions are answered, we can investigate the prospects for a deepening of the current boom in mobile telephony on the continent into a more meaningful transformation; entailing cheap and near universal telecommunications and internet access for African people, as well as the beneficial integration of Africa into a global informational society and economy.

Methodology

This dissertation has descriptive, conceptual, analytical and theoretical components. The main thrust of the dissertation is descriptive; i.e. it provides a description of the boom in mobile telephony (an outline of mobile subscriber growth and distribution), as well as its impacts. The conceptual, analytical and theoretical components involve a critical analysis of the concepts of the digital divide and the information revolution, as well as a literature review of the relevant approaches for investigating the relationship between African society and the mobile phone and other ICTs.

For the descriptive aspects of the dissertation, the author relied, in part, on tabloid resources. Due to the dissertation describing current events, tabloids had to be monitored for relevant articles. The author relied on archived tabloid collections at the University of Cape Town's African Studies Library. Monitoring of new tabloids and archived materials however proved cumbersome when utilising the printed format; thus, much tabloid research was done on the internet. The author utilised Google News searches[6] and online news databases with a particular focus on ICTs such as *allAfrica.com*[7], and *Balancing Act*[8]. An online technology that was particularly helpful for finding current tabloids was *RSS*. RSS allowed news to be read like email – i.e. recent articles from relevant tabloids (e.g. the *Financial Times, Business Day* and *Independent Online* technology feeds) were sent to the authors "inbox" as they became available. RSS also automatically categorised, indexed and stored articles on the author's computer for future reference. RSS made monitoring recent tabloids a lot quicker than scanning through printed materials and browsing the internet.[9]

For statistical data, the author relied heavily on reports by the International Telecommunication Union (ITU) – a United Nations (UN) body, and union of the international telecommunications industry. The ITU is currently the only authority providing consolidated statistics on telecommunications in Africa and the developing world. This dissertation relied extensively on the ITU's *African Telecommunication Indicators* (1998, 2001, 2004), as well as on the ITU's reports on telecommunications in the Least Developed Countries (LDCs), published in 1995 and 2006. Data was also utilised from the ITU's

[6] The Google News search engine is available at http://news.google.com.
[7] "allAfrica.com: Home", AllAfrica Global Media, http://www.allafrica.com.
[8] "Balancing Act News Update – African Internet Developments", Balancing Act, http://www.balancingact-africa.com.
[9] RSS stands for Really Simple Syndication. RSS Feeds are read with a computer programme called an RSS aggregator. There are many such programmes; the author utilised free one called FeedReader. RSS proved an invaluable tool for research and the reader is strongly recommended to use RSS technology. To find more about how to make use of RSS visit: Alexandra Samuel, "10 Steps to RSStocracy", alexandrasamuel.com (blog), posted 15 June 2005, http://www.alexandrasamuel.com/rsstocracy/10steps.

website.[10] The data was extensive and authoritative, it should however be noted that the ITU is a lobby group for the telecommunications industry, and its figures come from telecommunication operators rather than from independent investigations.

The author was fortunate enough to conduct three interviews during the course of preliminary research. These interviews were with Debbie Millar, from MTN Corporate Affairs; Philip Kruger, from Vodacom Regulatory Affairs; and Allison Gilwald, an Associate Professor and Research Director at the LINK Centre at the University of the Witwatersrand, School of Public and Development Management. Gilwald has previously served with the Independent Broadcasting Authority, the predecessor of the South African broadcasting and telecommunications regulator – the Independent Communications Authority of South Africa. Gilwald is currently on the board of the South African Broadcasting Corporation. She is a PhD candidate and has just completed a fellowship at the London School of Economics. The interviews were conducted in April 2007, and took the form of informal, face-to-face interviews. Interestingly, the interviews were recorded utilising the author's mobile phone, then later played and transcribed using a computer. Regrettably, the interviews happened at the preliminary stages of the research, before the research question was properly formulated; and were actually talking to, another research topic. The interview with Gilwald was the only one that was utilised in the dissertation. The others were however of invaluable assistance for preliminary research and conceptualisation of the problem.

The author also participated in action research by attending various conferences - the South Africa-Nigeria Investment Forum (Sandton, August 2006), the African Leaders Business Forum (Sandton, October 2006), and the Draft Policy on Digital Migration Consultative Workshop (Gallagher Estate, April 2007). Through these conferences, the

[10] "International Telecommunication Union", ITU External Affairs and Corporate Communication Division, www.itu.int.

author learned a lot about the telecommunications industry. The author was able to visit MTN headquarters with the Nigerian delegation from the South Africa-Nigeria Investment Forum. At the Digital Migration workshop, the author was able to network, and thus organise an interview at Vodacom.

The author also utilised conceptual and critical analysis concerning the two main concepts employed in the dissertation: the information revolution and the digital divide. The dissertation provides a literature review of the approaches relevant to the study of ICTs and society deemed important to the research. The literature review consists of journal articles from a number of social science disciplines. The literature review is interdisciplinary due to the nature of research on ICTs and society, which is interdisciplinary.

Outline

Chapter I provides an overview of the mobile telephony boom, conceived of and described in terms of increasing subscriber numbers. Chapter II provides some explanations of, and context for, the rapid growth in mobile phone subscriptions. Chapter III provides a conceptual overview and a literature review. It investigates and interrogates two concepts that are relevant to the dissertation: the *information revolution,* and the *digital divide.* It will also provide an overview of the academic approaches that the author considers relevant to, and useful for, the investigation and analysis of the effects of mobile phones (and other ICTs) on the African continent. Chapter IV provides an overview of the various impacts of mobile phones on the African continent. This includes an assessment of the social, economic and political effects of mobile phones, as well as a brief look at the role of mobile phones in conflict situations. Chapter V investigates the role of mobile phones vis-à-vis the various digital divides that exist between the Africa and the rest of the world, as well as within the continent. It investigates what effects mobile phones have had on these divides; focusing on

the relationship between mobile phone and fixed-line rollout, and the implications that this relationship has for the digital divide conceived of in terms of access to the internet. The conclusion provides a summary of the effects of the mobile revolution, and of the current state of the digital divide. It investigates future possibilities for the closing of the various digital divides that exist on the continent.

The rest of the introduction shall be devoted to explaining the necessary definitions for this research.

Concepts and definitions used

Telecommunications is defined by telecommunications historian Anton Huurdeman as "the technology of information transport". It involves the use of technology to transmit and receive information and communications over long distances. Currently the ITU defines telecommunications as "any transmission, emission, or reception of signs, signals, writings, images and sounds; or intelligence of any nature by wire, radio, visual or other electromagnetic communications". There are two main types of transmission of signal involved in telecommunications. *Line transmission* involves the sending of electrical signals, through copper wire and optical fibre, by means of overhead lines, underground cables and submarine cables. *Radio transmission* involves the transmission of signals through electromagnetic waves by means of radio and satellite systems.[11]

Telephony refers to the use of electrical signals to transmit voice information, done for most of the 20th century by means of line transmission (mostly over copper wires), to mainline telephones. This type of telephony is referred to hereafter as *fixed-line* telephony.

[11] Anton A. Huurdeman, *The Worldwide History of Telecommunications*, (Hoboken: John Whiley & Sons, 2003), 5, 14.

Mobile telephony refers to the use of radio transmission to transmit voice information to a mobile device. It is not a new technology, and has been available in rudimentary forms for the first half of twentieth century, mainly in the form of a two-way radio and used by police departments, cab drivers and other professional industries. [12] The initial problems with mobile communication systems were that the frequency bands (areas of frequency on the electromagnetic spectrum) used often became too crowded to accommodate more than a few calls. The concept of a cellular radio network solved this problem. Cellular technology involves the use of low-power transmitters that cover small areas (cells), rather than high-power transmitters covering large areas. Traffic is reduced within these smaller cells, and scarce frequency bands can thus be recycled in different (non-adjacent) cells. Mobile cellular technology thus allowed the mobile phone to become a viable means of mass communication.

The cellular radio model was first conceptualised by Bell Labs in the early 1940s. However, only in the 1950s and 1960s was it perfected to allow for personal mobile communications. Mobile cellular services went operational in America, Europe and Japan in the 1960s and 1970s. The digitisation of mobile technology allowed for mobile cellular communications to become a mass communications technology. Mobile phones technologies as we know them today are digital. The author uses the term *mobile phones* to refer to digital mobile cellular technology. Although *cellular phones* or *cellphones* are technically more correct terms, the author has chosen to use the word mobile as it is more concise and corresponds better with the wording of most of the literature on the matter.

The terms *Information and Communication Technology* (ICT) and *Information and Communication Technologies* (ICTs) will refer to technologies used for information and

[12] The first mobile telecommunication occurred in the same year that that Marconi transmitted the first radio signal across the Atlantic; in 1901 he constructed radio telegraph mounted on a steam-driven wagon. In 1909 the US Army Signal Corps installed radio telegraphs on horse carriages. Mobile telephony first emerged in 1921 when a mobile radio telephone service was set up by the Detroit Police department in the US (Ibid, 269 – 287).

communication. This is a broad term and can include amongst other technologies: telephones, mobile phones, computers and internet connections. Some literature includes 'old' ICTs like the radio and the television in the definition of ICTs, whilst other literature makes a distinction between 'old' and 'new' ICTs. ICT used to be more often referred to as Information Technology (IT); but with the advent of the internet, and the convergence of technologies involving information and communication, the acronym has been replaced with "ICTs".

This dissertation will rely on various measurements of the amount of mobile phones or fixed-lines in given populations. Telephone subscriber numbers as a ratio to population is usually referred to as teledensity. Teledensity is usually measured by the amount of telephones phones per 100 people. The equation is expressed below.

$$Teledensity = \frac{total\ number\ of\ telephones}{total\ population} \times 100$$

Teledensity is usually expressed as a number with two decimal places. In some literature, teledensity is called *penetration rate* and expressed as a percentage, these terms can be used interchangeably. Teledensity can be used to refer to either fixed-lines or mobile phones, or the combination of both.

Chapter I – The boom in African mobile telephony

Africa has in the past decade experienced, and is still experiencing, a boom in mobile telephony. This chapter will give an overview of the boom by focusing on the growth of mobile subscribers. Before proceeding, the author would like to add a few caveats about the measurement and interpretation of subscriber numbers.

Measuring and interpreting subscriber numbers

The amount of mobile phone subscribers reported in a given country or region, is a reflection of the amount of *activated mobile phone subscriptions* (both prepaid and postpaid),[13] rather than of actual ownership of mobile phones. There are many reasons why statistics on the amount of mobile phone subscriptions in a given population may be distorted. Devices such as payphones, data/internet connections or tracking and surveillance devices can all utilise a mobile subscription. Individuals may have more than one mobile phone subscription for home and work, and possibly for other reasons (e.g. illicit personal or secretive use, or in order to take advantage of specials offered by different networks). Many mobile subscriptions may not be in active use, due to being linked to stolen or lost phones. These subscriptions however, may continue to be counted by the operator for some time. Prepaid subscriptions are often not cancelled when a phone is stolen or lost, as there is no danger of the new owner running up a bill for the old user.

Another reason that mobile subscription statistics may be inflated is that mobile operators are often listed companies, beholden to shareholders who want to see evidence of subscriber

[13] Prepaid will refers to a "pay as you go" option for subscribership. With prepaid credits or "airtime" are bought before making phone calls. This is as opposed to postpaid, where the user has a contract and pays at the end of every month.

growth (in the hope of dividends and share-price hikes). As mentioned above the statistics for mobile subscriptions come from the ITU, which is a union of telecommunication operators.

In light of the above, mobile phone subscriptions are always likely to be larger than the amount of mobile phone owners to a significant degree. This is why many developed countries now have ratios of mobile phones to population of over 1:1. In summary, one should always read mobile *subscribers* as mobile *subscriptions,* in order to accommodate for these intricacies.

It should also be mentioned however, that mobile subscriptions do not necessarily represent the amount of mobile *users* – as one mobile phone may have more than one user. This is especially the case in Africa, where mobile phones are often shared amongst families and communities, and people may use mobile technology by using payphones or telecentres.[14] Access to mobile phones is not measured comprehensively, but is safe to assume that in the African context, mobile phone usage and access is much greater than the amount of actual subscriber numbers.

Telecommunications in Africa before mobile telephony

According to Andrew Hardy, "telephones in the past have been predominantly associated with urban areas. Subscribers to telephone services have been primarily government and business." Before mobile telephony, in developing nations fixed-line telephones were mainly a service for by political and economic elites.[15] Quality of service was often poor, the price of calls relatively higher than in the developed world, and a large proportion of the

[14] Telecentres refer to small businesses that offer customers the chance to make cellular calls - much like a collection of attended payphones based on cellular technology. Telecentres are often mandated as a result of regulation – mobile licenses include Universal Service License Agreements

[15] Andrew P. Hardy, "The role of the telephone in economic development", *Telecommunications Policy* 4,4 (1980): 279.

infrastructure was usually malfunct or offline. In most countries, the national telephone operator was an arm of the state dealing with post and telecommunications, or a state-owned enterprise operating as a monopoly provider. Lack of state resources, monopoly conditions, small economies of scale, the need for state revenue, and an opinion by the state that telephony was for elites, reinforced these conditions. Thus in Africa, information was in the words of anthropologist Clifford Geertz, "poor, scarce, maldistributed, inefficiently communicated and intensely valued."[16]

Telephony in Africa after the introduction of the mobile phone

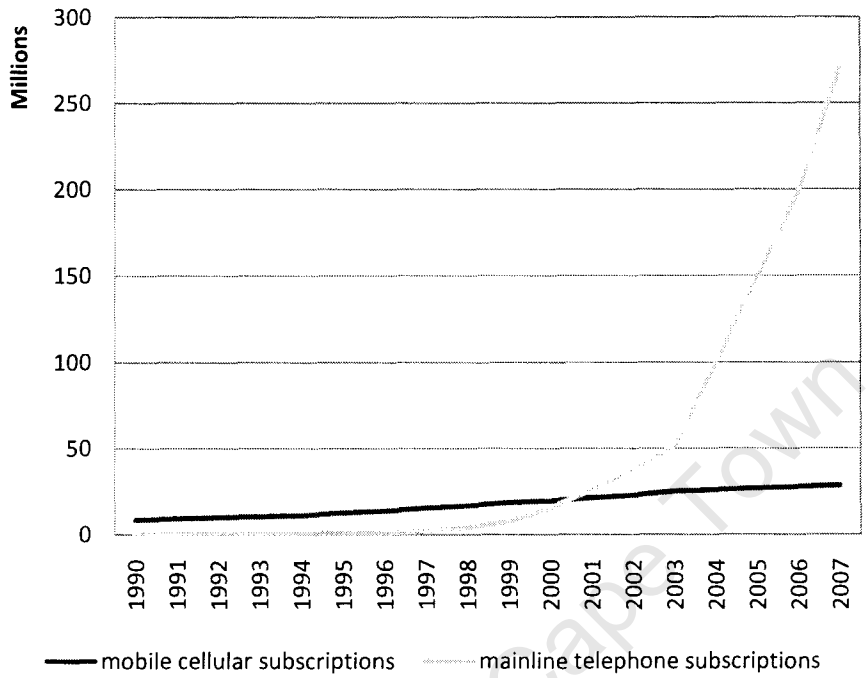
Mobile cellular technology reached Africa later than any other region in the world. Notwithstanding this, since the introduction of mobile telephony in Africa, the absolute levels of information and communication poverty have decreased significantly. All African countries now have mobile networks. In the 21st century there have been more new phone subscriptions in Africa than in the entire 20th century.[17] Mobile phones have rapidly replaced and overtaken landline subscriptions. Mobile phones overtook fixed-lines in 2001 (see figure 1.1), a year before this happened as a global average.[18] Despite this, Africa still has lower teledensity rates for both fixed-lines and mobile phones than any other region in the world.

[16] Clifford Geertz, "The Bazaar Economy: Information and Search in Peasant Marketing", *American Economic Review* 68,2 (1978), 28, cited in Leonard Waverman, Meloria Meschi and Melvyn Fuss, "The Impact of Telecoms on Economic Growth in Developing Countries" in *Africa: The Impact of Mobile Phones*, Vodafone ed., Vodafone Policy Paper Series 2, March 2005, 14 <http://www.vodafone.com/etc/medialib/attachments/cr_downloads.Par.78351.File.dat/GPP_SIM_paper_3.pdf>.

[17] *The Economist*, "Calling across the divide", 12 March 2005, 76.

[18] Telecommunication Development Bureau, "Africa, Telecom projections, 1995 – 2005", International Telecommunication Union, <http://www.itu.int/ITU-D/ict/statistics/at_glance/af_projections.html >, Updated 1 April 2004; International Telecommunication Union, *Mobile overtakes fixed: Implications for Policy Regulation* (Geneva: International Telecommunication Union, 2004).

Figure 1.1 Mobile and fixed-lines subscriptions (1990-2007)



Sources: International Telecommunication Union, "USD 55 billion committed to connect Africa"; Telecommunication Development Bureau, *African Telecommunication Indicators* (1998, 2001, 2004).

There have been exceptionally high growth rates in mobile subscriptions. According the ITU, from year-end 1998 to year-end 2006[19] African mobile subscriptions grew by 1 220%. Africa experienced the highest compound average growth rates (CAGRs) in the number of mobile subscribers of any region in the world.[20] Mobile phone subscriptions grew from 1990 to 1996 at 108.3% per anum,[21] from 1995 to 2000 at 88.6% per anum,[22] and from 1998 to 2004 at 65% per anum.[23] At the end of 2006 there were almost 193 million mobile subscribers in Africa. According to ITU forecasts, mobile subscriptions may have increased to 270 million

[19] Unless otherwise indicated all figures hitherto indicated represent the amount at year-end of the respective year.

[20] Telecommunications Development Bureau, *African Telecommunication Indicators 2004* (Geneva: International Telecommunication Union, May 2004), 1-2; International Telecommunication Union, "USD 55 billion committed to connect Africa".

[21] Telecommunication Development Bureau, *African Telecommunication Indicators 1998* (Geneva: International Telecommunication Union, May 1998), 36.

[22] Telecommunication Development Bureau, *African Telecommunication Indicators 2001*, 53.

[23] T his is compared to: Asia - 38%, Europe – 35%, Americas 24%, Oceania – 24%, and the world average of 33% (Telecommunications Development Bureau, *African Telecommunication Indicators 2004*, 1).

at year-end 2007[24]. According to these projections, the mobile market would have grown 540% from 2004 to 2007 at CAGR of 54.9% per anum. Despite CAGRs decreasing over time, Africa's mobile market has remained the fastest growing market of any region in the world, and in the last five years has grown twice as fast as the global market.[25]

Table 1.1 ITU statistics for African mobile and fixed-lines subscriptions (1990-2007)

Year*	Fixed-line subscribers ('000s)	Mobile subscribers ('000s)
1990	8538	14
1995	12 550	652
1996	13 663	1 162
1997	15 403	2 289
1998	16 719	4 207
1999	18 631	7 586
2000	19 799	15 564
2001	21 377	25 804
2002	22 832	38 020
2003	-	51 441
2004	-	100 345
2006	-	198 153
2007	28 476	270 000[‡]

* Years with data available. [‡] Projected figure.

Sources: International Telecommunication Union, "USD 55 billion committed to connect Africa"; Telecommunication Development Bureau, *African Telecommunication Indicators* (1998, 2001, 2004).

[24] International Telecommunication Union, "USD 55 billion committed to connect Africa".
[25] Ibid.

Chapter II - Explanations of the boom

What explanations are there for the boom in African mobile telephony compared to other regions of the world? It should be noted that mobile cellular telephony spread to Africa later than most regions of the world. In addition, it grew from a much smaller subscriber base than in the developed world – mobile telephony was introduced in Europe, Japan and United States (US) in the 1960s, and by the 1980s most of these countries had some form of mobile telephony systems[26]. Africa's late adoption of mobile technology helps account for the phenomenal rates of growth, as mobile subscriptions were growing from a much smaller subscriber base.

Technological explanations

Certain technological developments helped transform mobile telephony from a service for privileged elites from the late 1960s through the 1980s, to a part of everyday life in the developed world. These developments also helped spread mobile phones to Africa. Two technological "forces" were behind the advent of mobile cellular telephony as we know it today. Firstly Moore's Law (the increasing processing power of microprocessors assembled at minimum costs)[27] and the miniaturization of technology have allowed the mobile phone to become an object of everyday use worldwide, as well as to penetrate low-income markets. Moore's Law also means that the infrastructure (computer servers and electronic switches) supporting cellular devices (like base stations), has become cheaper, smaller and easier to

[26] Harald Gruber, *The Economics of Mobile Telecommunications* (Cambridge: Cambridge University Press, 2005): Ch. 1.

[27] Moore's law - stated simply is the observation that the processing power of a microchip assembled at minimal cost doubles once a year -, means that electronic components and microprocessors are increasingly becoming more powerful and cheaper to produce but they are also becoming increasingly smaller.

install. The second technological force behind the spread of mobile telephony involves innovations in transmission infrastructure. More advanced transmission technologies (like fibre-optic and microwave "backbones"), as well as better programming and algorithms for the efficient rationalisation, organisation and compression of frequency, have also aided in the rollout of mobile phones.

Another factor that helped facilitate the rapid growth of African mobile networks relates to the issue of technological path dependency. One particular technological standard, the Global Systems for Mobile communication (GSM) standard, has helped spur the boom in mobile telephony on the continent. GSM was the first technological standard for digital mobile cellular communications (known as 2G or "second generation" networks and phones). Africa's late entry into the mobile telephony market vis-à-vis the developed world meant that ultimately, it benefited from the adoption of the newest, most efficient and most commonly used standard for mobile communications. According to the ITU – "Africa has ended up as the world's most GSM oriented market outside Europe where that technology was mandated."[28]

GSM was a new technology in the early 1990s. However, by the time African mobile operators started spreading on the continent, its successes were proven and it was the logical choice for new operators. Technological path dependency meant that in a sense African networks were for a time more advanced than networks in other regions (notably, for example, the US), where pre-GSM or analogue technologies were already in implementation. At the same time, operators in other regions had to expend time and money on upgrades. It seems that here, contrary to the concerns of dependency theorists (outlined in chapter III),

[28] Telecommunication Development Bureau, *African Telecommunication Indicators 2004*, 2.

Africa benefitted tremendously from having to adopt a technological standard over which it had no control in development or approval.

Increases in processing power, the miniaturisation of electronic technology, and an advantage vis-à-vis technological path-dependency, have created the situation in which the rollout of mobile telephony has become economical and feasible in the developed world. However these reasons alone do not explain the spread of the mobile phone – that would be a technologically determinist explanation.

Mobile phones as a substitute for fixed-lines

If compared to fixed-line technologies, the reasons behind the spread of mobile telephony become more apparent. Because of the use of radio frequencies as opposed to physical copper or fibre-optic lines, as well as the cell-like structure through which mobile networks operate, mobile networks are easier able to overcome geographical boundaries, and are cheaper and faster to rollout than fixed-line networks. The installation costs are lower (by about 50% less per connection than fixed-line networks), and there is shorter payback period on investment. In addition mobile networks have "smaller scale economies and greater modularity" than fixed line networks.[29]

A major reason behind the remarkable growth rates in African mobile subscribers is the relative poverty of postal and fixed-line telecommunications infrastructure. According to *African Business magazine:* "as a result of the limitations and poor maintenance of fixed line telephone infrastructure in much of Africa, mobile telephones became popular on the continent as quickly as anywhere else in the world and now mobile phones are more common

[29] Waverman, Meschi and Fuss, 12.

than fixed line telephones in many areas."[30] Because of these characteristics "many countries with under-developed fixed-line networks have achieved rapid mobile telephony growth with much less investment than fixed-line networks would have needed."[31]

In all contemporary industrial (and agrarian) societies, there is a strong demand for communications infrastructure. In Africa, this demand was not adequately satisfied by existing infrastructures until the introduction of mobile phones. Postal services were slow and often ineffective. Transport infrastructure was sparse, degraded and often expensive. Currently mobile cellular technology has proved much better at matching supply to demand than has fixed-line infrastructure in the past.

Business models

Other reasons for the growth in mobile telephony in Africa involve:

- lower income barriers for mobile then for fixed-line use – due to lower connection costs and lower up-front expenditure (arising from pre-paid payment plans);
- the possibility of sharing mobile phones amongst individuals;
- and business models like the use of mobile phone technology in community based "telecentres", which have aided non-owners to use mobile phones and mobile technologies. [32]

[30] Neil Ford, "IT development from above", *African Business* August/September 2003, 42.
[31] Ibid., 11.
[32] Diane Coyle, "Overview" in *Africa: the Impact of Mobile Phones*, Vodafone, ed. The Vodafone Policy Paper Series 2, March 2005, p 6.

Competition

Competition in the telecommunications sector is another reason for the spread of mobile phones. Whereas the "providers of basic services remain monopolies in most of Africa. In contrast, the mobile sector in Africa opened rapidly to competition". "Both foreign and private-sector participation are becoming commonplace."[33]According to the ITU, at the end of 2003, three quarters of the countries on the continent allowed competition in mobile networks, up from 56% in 2001, and 7% in 1995.[34] In 2001, there were 100 mobile networks in Africa, up from 33 in 1995. As of 2003 there were no countries lacking a mobile network, this is compared with 28 in 1995.[35] According to the Vodafone report:

> there can be little doubt that the wildfire spread of mobile was triggered partly by the liberalisation of the telecoms markets in many African countries from the mid-1990s, including the issuing of private mobile licenses, often to international operators. Those countries which made an early start down this path – such as Gabon or Mauritius – have mobile penetration rates which might seem surprisingly high given other social and economic indicators, and their size; and the converse is true for countries where there were no early private licences issued, such as Algeria or Nigeria.[36]

Countries that do not allow competition in the mobile sector have had significantly low teledensity, compared to countries that allow competition. For example in 2003, in Ethiopia (where the government is the sole provider of all telecommunications services), teledensity was at 0.14, the third lowest teledensity on the continent after Guinea-Bissau and Liberia.[37] In addition to competition, regulation has also helped spread mobile telephony. Some of the specific rollout requirements of mobile licenses have helped increase mobile usage and

[33] Jacqueline Hamilton, "Are main lines and mobile phones substitutes or complements? Evidence from Africa", *Telecommunication Policy* 27 (2003): 13.
[34] Telecommunications Development Bureau, *African Telecommunication Indicators 2001*, 2. Telecommunications Development Bureau, *African Telecommunication Indicators 2004*, 17.
[35] Ibid.
[36] Coyle, 4.
[37] Telecommunication Development Bureau, *African Telecommunication Indicators 2004*

ownership.[38] For example, in South Africa and Nigeria, mobile operators are required to rollout into underserviced areas as part of their license agreement. In South Africa, mobile operators are also required to facilitate the establishment of telecentres.

[38] Coyle, 6.

Chapter III - Literature review

Nature of the literature

The literature review shall be concerned with what approaches are relevant for explaining and analysing the social effects of the mobile telephony boom in Africa. Literature on the mobile phone and other ICTs in Africa comes from a broader group of literatures on the interrelation between ICTs and society. Such literature comes from a plethora of disciplines. This is due to two reasons; firstly, the proliferation of ICTs affects all levels (individual to global) and sectors (economic, societal and political) of society; and secondly, the social study of ICTs is not an established discipline in its own right, but in the author's opinion, a nascent discipline. The study of mobile telephony in Africa has been largely interdisciplinary. Although there is a large amount of academic literature, a large proportion of the relevant research is comes from corporations, NGOs, advocacy and policy groups, and the business media. Research on African mobile telephony is conducted mainly by corporations (e.g. Vodafone and Motorola) and lobby groups within the ICT sector (e.g. the ITU and the GSM Association), as well as by regulatory authorities and telecommunications think tanks. Academic departments have emerged that devoted to this new subject area (e.g. the LINK Centre at the University of the Witwatersrand, and the Centre for a Digital Future at the University of Southern California). It is worth noting that the funding of these institutions comes often from telecoms companies (Vodacom funds the LINK Centre, IBM and Microsoft fund the Centre for a Digital Future).

Two substantive concepts from the literature on ICTs and society are relevant to this dissertation: the information revolution, and the digital divide.

The information revolution

The boom in mobile telephony is part of a global set of processes referred to as the 'information revolution'.

According to Wilson and Wong:

> The term "Information Revolution" refers to the bundle of technological, commercial and institutional changes in the information and communications sectors that have rocked the global system since the mid-1980s. Hallmarks of these changes are the tremendous global scope and speed of ICT diffusion. Accelerated technological innovation has brought new capacities to compress and store data available for transfer in new digital forms through various media to diverse users at different times. Whereas print, broadcast, telephony, video, and computing were until recently quite distinct technologies and industries, they are now rapidly converging toward a new form called "multimedia". Thus, the IR has come to mean the transformation of many separate appliances into local and global networks that facilitate health, education, commerce, government, leisure and other activities through cheaper, more powerful information processing and communication.[39]

The information revolution involves both the spread of old ICTs (like radio and television), and new ICTs (like the internet, mobile phones and satellite communication), although the focus is usually on the latter. The information revolution also refers to the social, economic and political effects of the proliferation of ICTs. The information revolution is reliant on two forces of technological change: increases in the computational power of information technologies, as well as improvements in the transmission architecture of those technologies.

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[39] Ernest J. Wilson III and Kelvin Wong, "African Information Revolution: a Balance Sheet", *Telecommunications Policy* 27 (2003): 156.

The digital divide

The digital divide is generally used to refer to inequalities between those with access to ICTs and those without. In the *Electronic Journal of Information Systems in Developing Countries*, the digital divide is defined as, "the gap between those with regular, effective access to digital technologies, in particular the internet and those without."[40] This gap is usually refers to a gap in access to ICTs between the developed and the developing world; but can also refer to a divide existing *within* countries and regions. The divide can exist at global, regional and national levels. At the national level, there is usually an urban-rural digital divide.[41] Statistical representations and measurements of the digital divide are usually done by comparing the ratio of selected ICTs to population (like for example, the use of teledensity as a representation of the divide).

However as it is a relational concept, how the divide will be perceived and described will rely on the countries, regions, population groups and classes chosen for comparison. Conceptualisation and measurement will also be dependent on what ICTs are regarded as significant, and thus chosen as proxies for measurement and comparison (e.g. will computers, internet access, fixed-line telephones, mobile phones and radios be included in measurement?). For example, in the United States, the term is "almost exclusively" used in reference to computer use:

> This interpretation contrasts in an interesting way to the rest of the world, where the term by no means has this narrow meaning. Instead, mobile communication plays an integral part in considerations of a digital divide in most countries save the US.[42]

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[40] Bjørn Furuholt and Stein Kristiansen, "A Rural-Urban Digital Divide?: Regional Aspects of Internet Use in Tanzania", *Electronic Journal of Information Systems in Developing Countries* 31,6 (2007): 1. <http://www.ejisdc.org/ojs2/index.php/ejisdc/article/viewFile/417/216>.
[41] S.S. Rao, "Briding the Digital Divide: Efforts in India", *Telematics and Informatics,* 22,4 (2005) cited in Ibid.
[41] Furuholt and Kristiansen, 1.
[42] Ronald E. Rice and James E. Katz, "Comparing internet and mobile phone usage: digital divides of usage, adoption, and dropouts", *Telecommunications Policy* 27 (2003): 206.

This dissertation will deal with two important types of divides: a divide between those with access to voice telephony and those without, and a divide between those with access to computers and/or internet services and those without. Bearing in mind these two divides, certain these questions comes to mind. What is the relationship between these two divides? Is one divide is more important than another? If so, then which is more important to Africa currently? This dissertation will as it progresses investigate the above proposition posed by *The Economist*:

> digital divide that really matters...is between those with access to a mobile network and those without...[r]ather than trying to close the [digital] divide for the sake of it, the more sensible goal is to determine how to use technology to promote bottom up development. And the answer to that question turns out to be remarkably clear, by promoting the spread not of PCs and the internet, but of mobile phones.[43]

The two divides above can be further categorised into subtypes. There are, within the two above-mentioned divides, different types of divides with regard to ownership, access and usage of ICTs. An American study, based on results from a national representative telephone survey of Americans in 2000, highlighted digital divides that existed with regard to both the internet and telephony. Within those two divides, further divides existed between users and non-users, veteran and recent users, and continuing and dropout users.[44]

The digital divide is not just a pure technological divide and "will not be understood if it is viewed purely as a technological phenomenon."[45] As certain ICTs like computers and the internet require a modicum of literacy for their effective use, the digital divide is also a symptom of a literacy divide.

[43] *The Economist* "The real digital divide", 11.
[44] Ronald and Katz.
[45] Furuholt and Kristiansen, 1.

According to *The Economist*, "the debate over the digital divide is founded on a myth – that plugging poor countries into the internet will help them to become rich rapidly...This is highly unlikely as the digital divide is not a problem in itself, but a symptom of deeper, more important divides: of income, development and literacy."[46] According to the International Telecommunication Union, "LDCs are also among the least developed in terms of the poor state of their telecommunication networks and the limited range of services offered." Of a list of the 48 "least telecommunication developed" (lowest teledensity) countries listed by the ITU in 1995, only 11 were not classified as LDCs. Thirty-six of these countries were from Africa (and 29 from Sub-Saharan Africa). [47] In addition to the digital divide being a symptom of economic conditions, the spread of ICTs may also contribute to the construction of new economic divisions.

The digital divide also has a political dimension. Access to ICTs can confer political power to those who have it, and the distribution of access to ICTs is largely determined by politics.

History of the term digital divide

In order to understand the term better we need to understand the history of it origins and usage. The digital divide was brought onto the global development agenda in 1981, through a resolution of the General Assembly of the United Nations recognising "the fundamental importance of communications infrastructures as an essential element in the economic and social development of all countries" [48]. In 1982, the ITU formally accepted the resolution, and with the UN jointly proclaimed 1983 to be the global year of communications. At

[46] *The Economist* "The real digital divide"
[47] International Telecommunication Union, *ICT and Telecommunication in the Least Developed Countries: Mid Term Review for the Decade 2001 – 2010*, (Geneva: International Telecommunication Union, 2006), 3.
[48] Resolution No. 36/40 of 1981

plenipotentiary conference in Nairobi in 1982, the ITU established an Independent Commission for Worldwide Telecommunications Development, mandated to recommend ways to stimulate the proliferation of telecommunications in the developing world. The outcome of the commission was a 1984 report, *The Missing Link*, also dubbed the "Maitland report", after its chairman, Donald Maitland.[49] The report highlighted a global telecommunications divide. Of the 600 million telephones in the world in 1984, three quarters were concentrated in nine industrialised countries, over half of the world population lived in a country with a teledensity equal to or below 1 telephone to 100 people, and three quarters lived in a country with a teledensity of less than 10. This was narrated as an ethical emergency. The "growing imbalance in the distribution of telecommunications worldwide was intolerable":

> In the industrialised world telecommunication is taken for granted as a key factor in economic, commercial and social activity and as a prime source of cultural enrichment. Moreover, in these countries telecommunications have come to be regarded as an engine of growth and a major source of employment and prosperity. The pace of technological innovation is such that inhabitants of the industrialised world look forward to enjoying the full benefits of the so-called "information society" by the end of the century.
>
> The situation in the developing world is in stark contrast. In a majority of developing countries the telecommunications system is inadequate to sustain essential services. In large tracts of territory there is no system at all. Neither in the name of common humanity nor on the grounds of common interest is such a disparity acceptable.
>
> It cannot be right that in the latter part of the twentieth century a minority of the human race should enjoy the benefits of the new technology while a majority live in comparative isolation.[50]

[49] Independent Commission for World-wide Telecommunication Development, *The Missing Link* (International Telecommunication Union, December 1984).
[50] Independent Commission for World-wide Telecommunication Development, 3.

Ten years later the digital divide is still narrated as an ethical emergency and moreover as race that LDCs are losing, according to a 1995 ITU report on telecommunications in LDCs:

> There is evidence to suggest that [LDCs] are falling further behind other developing countries in the race to construct modern telecommunications networks. This failing arises not so much because they are not installing the latest equipment – in many cases the LDCs have modern, state-of-the-art digital networks – but rather that they are not expanding fast enough to close the gap with other developing countries. [51]

In relative terms, even as the absolute number of ICTs in the developing world increases, the gap between the developed and developing world is still widening. This divide increases with the pace of technological change, and as the income gap between poor and rich countries continue to increase. Does it make sense to expend so much energy on bridging a technological divide that is doomed to increase? Why is the divide considered so important in global policy?

The answer lies, in part, in it being pushed into the global policy agenda by international telecommunication companies. The ITU is, after all, a global union of telecommunications companies, as well as government authorities who draw revenues from this sector. The Maitland Report was funded by, amongst others: AT&T, British Telecom, the NEC Corporation, Motorola and Rockwell, Nortel Networks and Siemens. The 1995 ITU Report, *Telecommunications in the LDCs* was funded by Motorola. These are all large telecommunications and related companies from G8 countries (the US, UK, Japan, Canada and Germany), with a stake in the growth of the industry.

The ITU mainly conceptualises and problematises the digital divide as a technological divide. Although the economic context is addressed, there is almost no political context to the

[51] International Telecommunication Union, *Telecommunication Indicators for the Least Developed Countries* (Geneva: International Telecommunication , July 1995), 1.

divide. The digital divide is not just a technology divide, but it is also a *power divide*. It is a divide between those who have access to ICT-based power – power over the production, reproduction and dissemination of knowledge through ICT, as well as power over markets and production processes –, and those that do not.

The power divide was identified before the Maitland Report, in the 1970s and 1980s, when it became an international political issue – arising from the debate over the New World Information and Communication Order (NWICO). NWICO arose from concerns, within the Non-Aligned Movement (NAM) and the developing country caucus of UNESCO, over global control over mass media and communications, and its effects on the developing world. The debate highlighted a concern by the second and third worlds, over a divide between those who wielded control over certain ICTs (like satellite communications), and those who did not.

In March 1976, at the Non-Aligned Symposium on Information in Tunis, in line with a mandate from the NAM summit in Algiers 1973, a programme to overcome imbalances in the flow of information and communication was drawn up in order to "'obtain the decolonization of information and initiate a new international order in information."[52] In the discussion of the NWICO a number of concerns were brought up by developing countries regarding the state of the global ICT order at the time, including:

- unbalanced and politically influenced news reporting on the developing world, with four agencies at the time controlling 80% of global news media;
- an unbalanced flow of media from the developed to the developing world;
- saturation of the developed world with Anglo-Saxon and American media;

[52] Quoted in Claudia Padovani and Kaarle Nordenstreng, "From NWICO to WSIS: another world information and communication order?", *Global Media and Communication* 1,3 (2005): p. 264.

- concerns over the unequal division of radio spectrum (a small number of developed countries controlled over 90% of the spectrum);
- concerns over the allocation of geostationary orbits of satellites;
- and finally, concerns over satellite broadcasts, from the developed world into the developing world, that lacked state approval, and thus infringed on national sovereignty.

The MacBride Commission, established by UNESCO, produced the "MacBride Report", outlining the tenets of the NWICO. The commission submitted a preliminary report at a UNESCO General Conference in 1978, and the final report was approved in 1980. The strength and credence for the calls for a NWICO were no doubt undermined by the United States, which saw the MacBride report as an affront to the free flow of information (as well as to the interests of American corporations), and eventually withdrew its membership in 1984.

Current global debates and initiatives around the information society and the digital divide, such as those represented by the ITU and the G8's World Summit on the Information Society (WSIS), do not adopt the political approach to ICTs that the NWICO did. The NWICO arose in a context that was "drastically different" to the current global political context:

> In the 1970s the world was divided both along an East–West and a North–South axis. ...the Soviet Union and Warsaw Pact constituted a clear and present political danger for the USA and NATO – and vice versa. On the other hand, the developing countries, with their political organization NAM, constituted a strong voice of the South, placing the North on the defensive, especially after the oil crises of 1973 and 1979. And in the political world of communication the East and the South were 'natural allies', placing the West very much on the defensive and rendering the UN organizations including UNESCO relatively hostile to the Western side. This was an explosive situation where

> NWICO not only represented communication policy issues, but a geopolitical balance of forces in the global arena in general. Today the East–West divide is mostly gone and the North–South divide is in the throes of neo-liberal solutions, while the NAM is marginalized and the multilateral UN weakened by US-led bilateral relations.[53]

The above is from a paper, in a media journal by Claudia Padovani and Kaarle Nordenstreng, which takes the form of an intergenerational discussion between Padovani, a younger scholar who adopts the WSIS approach and Nordenstreng, an older scholar involved in the NWICO. Nordenstreng explains the differences between these two approaches:

> WSIS is predominantly built on an information technology approach, and this is naturally too narrow and shallow for any serious analysis. NWICO was quite the opposite, with predominantly a political approach. However, this political approach does not qualify as a model for replacing a one-sided technological approach. The debate of the 1970s was mostly over-politicized; political considerations dominated so much that little room was left for cool analytical reflection. Hence we should not reduce the issues to either politics or technology but aim for a balanced analytical approach where politics and technology have their proper place along with other relevant factors. So I admit that it is intellectually counterproductive to be too political (as we typically were in the 1970s), but by the same token I insist that it is equally counterproductive to be obsessed just by technology (coming from the land of Nokia I call this the 'Nokia syndrome').[54]

Approaches to the digital divide need to encompass both technological, as well as political considerations, in order to provide meaningful analysis and solutions. Unfortunately, due to a shifting of global power relations, current attention to the digital divide is drawn mainly to the technological and economic aspects of this divide, but not to the political aspects.

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[53] Claudia Padovani and Kaarle Nordenstreng, "From NWICO to WSIS: another world information and communication order?", *Global Media and Communication* 1,3 (2005): p. 267.
[54] Ibid. 268.

The extent of the global digital divide

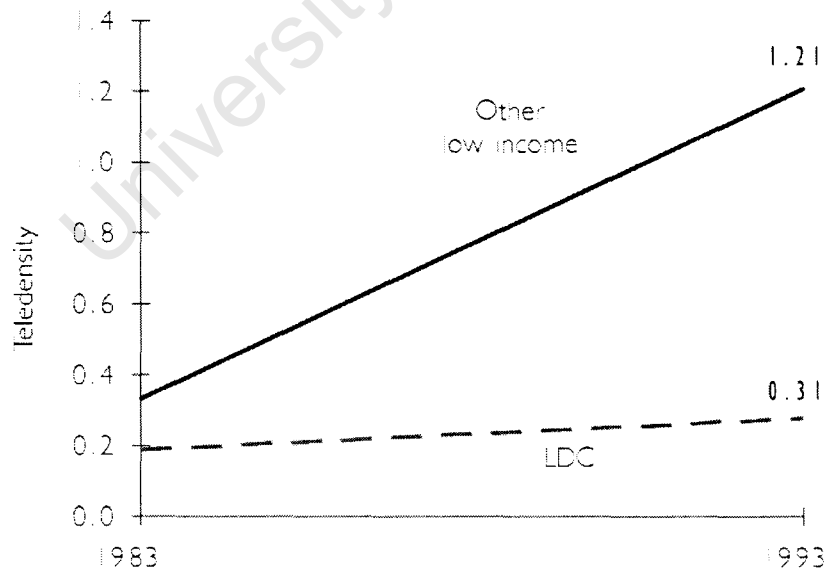
In terms of teledensity, there is a global digital divide between LDCs and the rest of the world. In 1995, the ITU reported that:

> There exists a very wide gap between the telecommunication facilities of developed countries and those of the LDCs... The total number of telephone main lines in the 48 LDCs stands at just over 1.5 million. To put this figure into perspective, it is just over one per cent of the total number of lines in the United States, even though the United States population is less than half that of the LDCs combined. [55]

Moreover, there was a growing gap between Least Developed Countries (LDCs) and middle-income countries, whereas most LDCs had

> increased their level of teledensity [from 1983 to 1993] over the last decade, the group of other low income countries (including China, India, Egypt and Pakistan) has increased ... more than three times faster.[56]

Figure 3.1 The growing intra-LDC teledensity gap 1983 - 1993



Copied verbatim from: International Telecommunication Union. *Telecommunication Indicators for the Least Developed Countries 1995.*

[55] International Telecommunication Union, *Telecommunication Indicators for the Least Developed Countries*, 1.
[56] Ibd.

According to the ITU's latest report on telecommunications in LDCs, "the current state of telecommunications in the least developed countries shows that progress is being made towards bridging the digital divide. Since 2001, the number of people using information and communication technologies has tended to rise exponentially."

- In 1995, all the 48 LDCs listed by the ITU had teledensities of less than one.
- By the end of 2001, of the 49 LDCs in the 2006 report, 36 had teledensities of above one.
- By the end of 2003, 15 LDCs had teledensities above five, whilst 31 had teledensities above two.
- In 2004, 21 LDCs had teledensities of above five.[57]

Approaches

The author shall now investigate below some of the approaches relevant to the study of mobile phones in Africa.

Modernisation

The dominant trends in literature on the effects of the mobile telephony in Africa have a lot in common with older modernisation literature, which studied the proliferation of old ICTs (like TVs, radios and fixed-lines) in the developing world 1950s and 1960s. This literature tended to focus on the educative and modernising effects of ICTs (in particular the radio). The state was conceived of as central to the process of ICT rollout. This literature was written at a time when Western aid agencies, in particular the United States Agency for International Development (USAID), were committing large amounts of capital towards the rollout of

[57] International Telecommunication Union, *ICT and Telecommunication in the Least Developed Countries: Mid Term Review for the Decade 2001 – 2010*, 6.

radios and radio stations. During the cold war, the state's monopoly of opinion through its state-owned broadcasting corporations was often overlooked by Western donors – in the interests of promoting a modernisation culture through the media, and maintaining regimes that were pro-US and pro-West.

Similar approaches were adopted towards the rollout of fixed-lines in the developed world in the 70s and 80s. Fixed lines were held to have modernising effects, not just culturally, socially and politically, but also economically. There are similarities between literature on the radio and later literature on fixed-lines. Both approaches have the tendency to see developmental problems as arising from a lack of information, for which both the radio and the telephone were seen as remedies. Literature on the telephone, however, tended to focus on the role of private corporations rather than the state in the rollout of telephony.

The current literature on mobile and fixed-line telecommunications also tends to focus on the role of private corporations rather than the state. This change is due to the following:

- the current theoretical and policy focus on democratization in the developing world;
- the failure of state-owned telecommunications companies to provide adequate access to landlines, and to meet the growing demand for telecommunications and internet services;
- the emergence of a global trend in telecommunications deregulation, starting in the US in 1982;
- and the general trend in neo-liberal governance of national and international regimes (and resulting prescriptions for competition, privatisation and foreign direct investment), enforced through the international financial institutions by means of aid and conditionality.

The commonality between the old and the new literature is that developmental problems are seen as arising from a lack of information, and the proliferation of ICTs is still largely held as an end-in-itself. Other similarities in both the literatures lie in the call for developing nations to technologically "catch-up" to the developed world in order to fulfil the imperatives of development. Many scholars have compared the policy focus on the digital divide to previous initiatives in the Third World that narrated the absence of certain technologies as somewhat of a development emergency:

> This kind of thinking has something in common with the campaigns to promote tractors in African agriculture from World War II into the 1970s. The tractorization campaigns started with the notion (but not the phrase) of a "tractor divide." Developed countries had lots of tractors, African agriculture had hardly any: therefore the U.S Agency for International Development (USAID), the British government, the World Bank, and the East Germans promoted tractors as a techno-fix that could avoid or help to moderate the institutional obstacles to higher land productivity in Africa. When evidence of high failure rates became too obvious to ignore, the solution was more training and more political will.[58]

Literature on regulation and deregulation

A lot of literature focuses on regulation and deregulation of the telecommunications sector, this is an area of mainly economic research, and is part of a broader economics literature on regulation in general. The field of telecommunications deregulation, an economic and mainly policy-based area of research focusing on the deregulation of the telecommunications sector, arose in the context of the deregulation of the US telecommunications sector in 1982, which in turn gave rise to a global trend in telecommunications deregulation. This was also in the context of global trends in governance and analysis, which highlighted the importance of a decreased role of the state and increased competition in various sectors. The original focus of

[58] Robert Hunter Wade, "Bridging the Digital Divide: New Route to Development or New Form of Dependency", *Global Governance* 8 (2002): 448.

the literature was on liberalisation, privatisation and deregulation – i.e. how the telecommunications industry could be transformed from state-owned monopoly, to a competitive industry with private players

Literature on regulation involves not just the retreat of the state (deregulation), but also an investigation into how the state can influence and direct the telecommunications industry through legislation (regulation). Current trends in the literature focus more on regulation than deregulation, and have more scope than the narrow focus of the original 1980s literature. This wider scope is more appropriate than a narrow focus on liberalisation, privatisation and deregulation for two reasons. Firstly, it reflects the realities on the ground. Telecommunications has been and will always be inherently oligopolistic; furthermore, the private sector will always need a close relationship with the state. Telecommunication is a public good and a scarce resource, this is even more so with mobile telecommunication. Available radio frequency (needed for mobile telecommunications) is a scarce good, which needs to be authoratively allocated in an efficient manner. Secondly, a focus on regulation, rather than just on deregulation, allows for analysis of how the state can be used to affect universal access. For example, certain license agreements require that the respective operator roll out in underserviced areas.

At an international level, regulation has been important in the telecommunications sector due to inherent transnational issues like interconnection rates and access to international communications backbones. The study of international organisations and regimes is pertinent to an understanding of the sector. This is especially the case in the mobile telecommunications sector, where issues like roaming and compatibility are crucial for a globalised business practices and for mobile and networked transnational bourgeoisies and elite groups. An important issue in mobile telecommunications – that of technological standards – has led to strong transnational regimes, in which there is a strong relationship

between the public and private sectors and the structures of global governance. The GSM standard, which covers 80-90% of the world's mobile subscribers, arose from the efforts of European governments and the European Community/European Union as well as that of the industry (the GSM Association). It is one of the strongest standards-based regimes in the global ICT industry. The GSM story highlights the importance of regulation in the sector, and that regulation is not necessarily opposed to the interests of the industry.

Dependency & post-colonial approaches

Another approach to the proliferation of ICTs in the developing world and Africa comes from dependency theory. Dependency-influenced approaches hold that a country's position in the global ICT economy, and it position vis-à-vis the digital divide; is determined by its place in the world system, the international division of labour and the social relations and processes arising from production. Furthermore, the quality, quantity and distribution of certain ICT infrastructures will have a bearing on the ability to the said country to integrate beneficially into this global system. "Globalisation in not only enabled by ICTs", but in addition "a country's level of connectivity determines to a large extent whether or not (and how) it will benefit from the globalisation process".[59] Thus from this perspective Africa's position in structurally determined as marginal and caught in a feedback loop that does not bode well for its integration into the global information economy.

This picture is not an inaccurate one. The global informational economy is based around oligopolistic nodes, located mainly in the "triad" power blocks of the developed world. A few

[59] Y.Z. Ya'u, "The new imperialism & Africa in the global electronic village", *Review of African Political Economy* 31,99 (2004): 12.

very strong corporate structures and alliances dictate the structure of most of this economy.[60] Economic and power structures are usually in favour of corporations from the developed world.[61] Despite a large proportion of the material life-blood of the information economy (minerals like gold, copper and tantalum) being extracted from her soil, Africa is not a producer of the any of the equipment, software or services offered by the global ICT economy, and does not any control over the standards dictated by it. Nonetheless, Africa is dependent on many of the products and services of the ICT economy.

Robert Hunter Wade provides a picture of how Africa is dependently integrated into the global ICT economy through technological standards. Technologies and regimes of technological standards

> are designed by developed country entities for developed country conditions. As the developing countries participate in ICTs, they become more vulnerable to the increasing complexity of hardware and software and to the quasi-monopolistic power of providers of key ICT services[62]

There is no central authority, which decides upon standards and thus ensures compatibility. Users in developing countries "are being tied more tightly into hardware and software escalation with ramifications difficult to anticipate"[63] Given these considerations, "efforts to bridge the digital divide may have the effect of locking developing countries into a new form of dependency on the West"[64]. Hunter concludes that "escape is increasingly limited, and the costs grow as the dependence of the users increases. This is a new form of

[60] An example of one of these nodes is the intersection of Intel hardware and Microsoft software into a monopolistic nexus of control of the market for end-user (consumer) computing such that over 90% of the world end-users are running on and networking with "Wintel" machines.
[61] For example, in telecommunications this is reflected in interconnection and termination rates for international calls, which are almost always skewed in favour of corporations from the North.
[62] Wade, 443.
[63] Ibid., 448, 452.
[64] Ibid., 443.

international digital dependence for which we need a new version of the 1970s dependency theory." [65]

Dependency theorists hold that the Western aid industry, by promoting ICTs, may be "reinforcing the overall dependency of developing countries." [66] ICTs are being "oversold" as a key to efficiency in government and other public organisations, and are being presented in the development community "as though they can leapfrog over the more familiar developmental problems." Y'au sees efforts to bridge the digital divide as, "part of wider efforts to not only secure the virgin markets of developing countries, but also to configure the world in the interest of the new imperial powers."[67] Thus "the continent faces the challenges of imperialism anew, this time as represented by knowledge dependence."[68]

Dependency gives an accurate picture of the actual structures of power in the global information economy, but it offers no solutions. ICT-based relationships of dependency cannot simply be broken by refusing ICT products and services. Africa is part of a global economy in which technology is essential for integration. Basic mechanisms of national economies, as well as the basic Weberian functions of the state, are now almost impossible without the use of computer networks.

A weakness of dependency approaches stems from their focus on structure over an almost entirely marginalised conception of agency. Dependency approaches offer almost no prescriptions as to how Africa can benefit from the global information revolution. Since most dependency-influenced theorists find that they cannot rationally prescribe for Africa to "delink" from the global information economy, they fail to offer any prescriptions other than implicitly endorsing "catching up" through more access to ICTs – a prescription espoused by

[65] Ibid., 448, 452
[66] Wade, 443 - 444.
[67] Ya'u, 12.
[68] Ibid., 14

modernisation-type theory, as well as the key corporate players in the global information economy and their G8 governments. Thus in a certain light the two approaches become functionally equivalent. [69]

Dependency-based approaches overlook characteristics of the ICTs that do not inherently lend themselves to the reproduction of the political and economic status quo. ICTs do not launch all societies on similar social, economic, political and developmental and paths. The proliferation of ICTs will inevitably lead to an important modicum of change in the broader set of economic and political relations in which they are been embedded. However, the extent and direction of this change can vary according to context. This change may reinforce or challenge existing structures of power. ICTs can be a tool for replicating current modes of production and political and economic structures of power. ICTs may also serve as a tool for the confrontation of power. They provide anonymity and the facilities to create digital social-networks and resultant real world communities for social-action. ICTs can thus also provide tools to challenge long established political, societal and economic institutions.

Critical and knowledge-based approaches

The last set of approaches that will be investigated include both constructivist and power-knowledge based or critical approaches. Hereafter they will be referred to as *critical approaches*. These approaches hold ICTs to be socially constructed, rather than technologically determined. ICTs are not viewed as occurring in a vacuum, and the political, economic and social circumstances in which they occur are important for analysis. The possibilities provided by ICTs are judged by the societal circumstances in which they arise.

[69] This dilemma is perhaps this why the Marxist analyst of the information revolution, Manuel Castells now finds himself researching at an institute funded by IBM and Microsoft (the Centre for a Digital Future at the University of Southern California). In providing a structural outline of the global information society and the components that are left out of this "Network Society" (the third world) he has contributed to the narration of the digital divide as a social and economic emergency (and the growth of an industry that studies it), in much the same manner as modernisation-type theory.

The methods of critical approaches involve discourse analysis, and a focus on the nexus of knowledge and power behind the production and reproduction of discourses on ICTs.

ICTs are the means by which a large degree of information and knowledge is communicated in today's society, especially in the transnational arena. ICTs are not just a subject of scientific knowledge, but are a means by which contemporary "scientific" knowledge is created, disseminated and consumed. ICTs thus have a "dual role as both a medium and subject of discursive power relations." Critical scholars see "the role of ICT [as] becoming increasingly important as informator, mediator, and integrator of developmental power relations". ICTs affect and reproduce power relations especially in the Third World, where there has been an "increasing role played by ICT in mediating development discourse" such that it "has become deeply involved in the conception and practice of socio-economic development within the so-called less-developed countries".[70] Schech holds that the "ICT revolution's promises and threats for developing countries can be brought into clearer perspective if we pay attention to the underlying discourses on development and knowledge employed in this debate."[71]

An example of critical research can be found in that of Merridy Wilson. Wilson explores public ICT and development discourse, and finds within it a current of technological determinism and a conception of technology as "a neutral tool for development", which allows "the complex political factors influencing poverty and inequality at local, national and international levels to be hidden, or at least go largely unquestioned". In addition, "the use of technology as an index of development reproduces the binary opposition between the developed and underdeveloped." Although critical/knowledge based approaches problematise

[70] Mark P.A. Thompson, "ICT, Power, and Developmental Discourse: A Critical Analysis", *Electronic Journal of Information Systems in Developing Countries* 20,4 (2004): 1,15. <http://www.ejisdc.org/ojs2/index.php/ejisdc/article/viewFile/122/122>.

[71] Susanne Schech, "Wired For Change: The Links Between ICTs and Development Discourses", *Journal of International Development 14* (2002): 13.

the assumptions of discourse on ICT and development, they are not "negation[s] of the potential roles of ICT for development initiatives, but instead a critique of the apolitical determinism underlying much of the ICT and development discourse".[72]

These approaches allow us to understand the broader discourses from which approaches to ICTs arise, as well as the power structures behind these discourses. Furthermore, critical approaches allow for progressive thinking and a more meaningful conception of agency. Approaches that focus on the intersection of power and knowledge are appropriate for the study of an industry that structures and reproduces the means through which contemporary "scientific" knowledge is created, disseminated and consumed.

Organisation of the literature

The relevant literature on the information revolution and the digital divide could be organised according to whether its foci lie in the social, economic or political spheres, but such categorisation is unhelpful as the information revolution permeates all these spheres. A disciplinary categorisation could also be attempted. The literature originates from many disciplines (including anthropology, sociology, media and communications studies, political science, political economy, economics and information systems), but these divisions are irrelevant in the largely interdisciplinary field. This dissertation shall rely on literature from a sampling of relevant disciplines.

The author has, for practical purposes selected two important axes by which to organise the literature (diagrammatically outlined in figure 3.2). Firstly, literature can be classified (as it is on x-axis of figure 3.2), according to its focus on either direction of the causal

[72] Merridy Wilson, "Understanding the International ICT and Development Discourse: Assumptions and implications", *The Southern African Journal of Information and Communication* 3 (2003): 5. <http://link.wits.ac.za/journal/j0301-merridy-fin.pdf>.

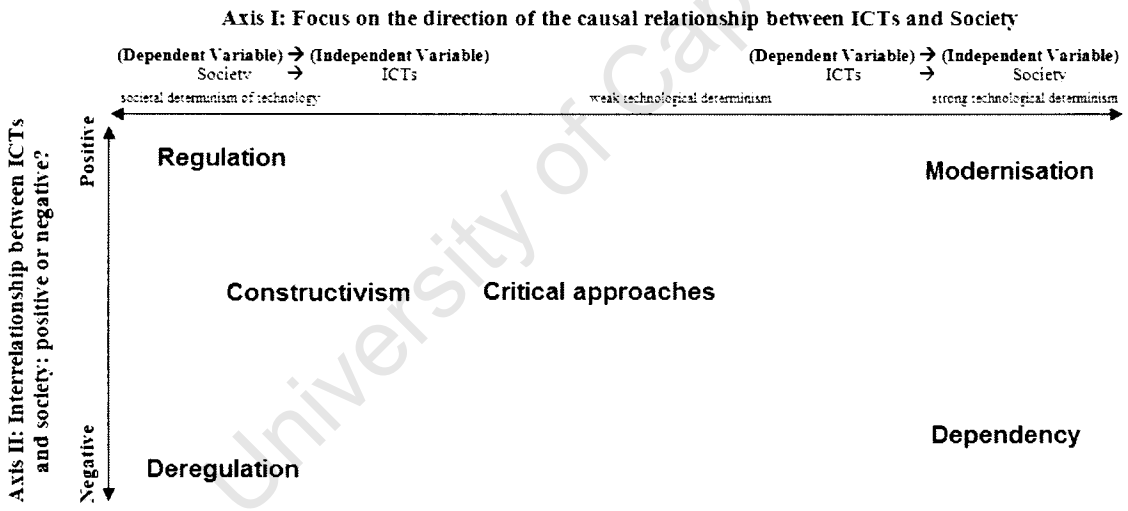
relationship between ICTs and society. Some literature focuses on the social, political and economic effects of ICTs. Whilst other literature focuses on how political, economic and social structures and relations affect ICTs – that is, how ICTs are affected by political governance/regimes, markets and society. In reality, theory is not neatly divided in this manner. ICT obviously simultaneously affects, and is affected by society. The conceptual division between society and technology is arbitrary, as technology is an artefact of society. Society, culture and politics cannot be investigated without reference to the technological artefacts of the society in question. Furthermore, the technological artefacts of society do not represent something separate to society, but rather a part of it. Technology is constructed by society, and society in some sense constructed by its technology. It is however useful to distinguish between social and technological variables and look at how they influence each other; as long as we bear in mind that they are mutually constructed and cannot be cleanly divided.

Two important tendencies in the literature are: (a) literature that focuses on the effects of ICT on society – the social, economic and political effects of ICTs, and (b) literature that focuses on the effects of society on ICTs – e.g. the effects of society, the market and governments on ICTs. Modernisation and dependency approaches would fall under category (a), whilst regulatory approaches would fall under category (b). Critical and constructivist approaches would fall somewhere in-between, but leaning more closer to (b).

The place of a theory with regard to this axis depends on a conceptualisation of to what extent ICTs affect society. Many theorists argue that ICTs have had strong, social, political, economic and cultural impacts. However, these theories vary in their degree of technological determinism – that is they vary in how much they think that technology influences society. Critics of technological determinism have distinguished between "strong" and "weak" *technological determinism*. Strong technological determinists believe that ICTs are either

sufficient or necessary conditions determining social organisation and development. Weak technological determinists claim that ICTs can be enabling or facilitating factors (in conjunction with other mediating factors), leading to opportunities that may or may not be taken up by societies, and thus affect social organisation and development. Strong technological determinists hold that the impact of the introduction of ICTs are determined mainly by the inherent features of the ICTs in question, whereas weak technological determinists feel that it is mainly human choices within social structures that determine the impacts of ICTs.[73]

Figure 3.2 Organisation of the literature



The second axis (the y-axis) by which literature can also be divided is whether the interrelationship between ICT and society is held to be positive or negative. The questions involved are; do ICTs positively or negatively affect society? And how does society reinforce these relationships? Most literature shows that the interrelationship between ICTs and society

[73] Arlene Grossberg, Jaré Struwig and Kholad Tlabela, "Contextualising the global information revolution a development arena: A case study", *Communicaire* 18,2 (1999): 87 – 88.

can be both positive and negative. Nonetheless, there can be identified literatures that focus on either the positive or the negative effects of ICT. Two important bodies of theory in marked opposition corresponding to this axial division are modernisation- and dependency-based approaches. The former more often focus on the positive effects of ICTs, whilst the latter more often focus on the negative effects of ICTs.

Chapter IV – The impact of mobile telephony in Africa

Mobile phones are affecting the continent socially, economically and politically to an extent that is arguably unprecedented – when compared to the introduction of previous ICTs like the radio, the television or the fixed-line telephone. According to *The Financial Times,* "in just a few years, wireless telephony has changed the way Africa lives and works. No other technological innovation in recent times, even the internet, has made such an impact."[74] The boom in African mobile telephony has had vast and profound social, economic and political effects from the individual to national, regional, continental and global levels of analysis. This chapter attempts to provide a brief overview of these effects.

Multipliers of impact

Two characteristics of mobile telephony in Africa multiply its significance and effects. Firstly, the impact of mobile phones has been magnified due to their role as a substitute for fixed-lines. According to *The Economist*, mobile phones are "are of particular value when other means of communication (such as post or fixed-line phones) are poor or non-existent"[75]. According to the Vodafone report, *Africa: the impact of mobile phones* "when other forms of communication are poor, whether roads or fixed-line telephones, the value of quality mobile communications is much greater".[76] Secondly, due to the way mobile phones are used in the developing world, the scope of their impact is larger than is intuitively evident from subscriber numbers.

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[74] David White, "How Africa joined the wireless world", *Financial Times,* November 27 2005, 12.
[75] *The Economist* "Calling across the divide", 78.
[76] Gough & Grezo, 2.

The Vodafone report states that:

> While penetration rates are by the standards of the developed countries low, the way in which mobiles are informally shared between people, the formation of private resellers of mobile services and the provision of mobile phones for public use, all increase accessibility, even in rural communities. The impact of mobile extends well beyond what might be suggested by the number of subscriptions alone...The developed world model of personal ownership of a phone is not relevant, or indeed appropriate, to the developing world.[77]

In Africa, even if individuals do not have ownership of a mobile they may still have the use of one. The Vodafone report sampled a group of rural communities in South Africa and Tanzania in which mobile ownership and usage was prevalent.[78] In the South African sample 67% owned a mobile, whereas a further 10% used them but did not own one, 23% did not use mobile phones at all. In the Tanzania 43% owned mobiles, whereas 42% used them but did not own one, and only 16% did not use mobile phones at all. Furthermore when the study looked at access to mobile phones regardless of usage it was found that 97% of respondents could use one "if they wished to", whereas only 28% could access a landline if they so wished. Furthermore, respondents in Tanzania (but not South Africa) often considered the phone as a household, rather than an individual asset.[79]

These examples provide evidence that mobile phones may have more of an impact in Africa than in the developed world. Investigated below are the, social, economic and political impacts of mobile phones.

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[77] Ibid.

[78] The sample was by no means representative of the countries involved, the communities chosen for the survey were chosen deliberately because they exhibited a bias towards the use of mobile phones. The sample from Tanzania was of 252 people in from 10 rural communities. The sample from South Africa was of 223 people from 11 rural communities.

[79] Vodafone, "Introduction to the community and business surveys" *Africa: the Impact of Mobile Phones*, Vodafone, ed. The Vodafone Policy Paper Series 2, March 2005, 45.

The social effects of mobile phones

At the level of interpersonal social relations, the mobile phone has made available reasonably affordable voice and text communication between individuals and amongst groups, which eliminates the obstacles of transport and old communication infrastructures – whereas before mobile telephony, complete absence of communications was the norm between those separated by geographical barriers. This is of particular importance in Africa, due to the impoverishment of her transport and communications infrastructures, and the significance of communities that exist across international borders, which comprise of migrant workers, intracontinental and international diasporas, and those left at home. This is also of particular significance to Southern Africa due to the historical prevalence of migrant labour, as well as emigrants and exiles due to political, economic and social crises. The Vodafone report says that:

> To the extent that mobile communications are reaching some rural areas with little or no fixed line availability, rural people are better able to stay in contact with family members. Mobiles are also improving the flow of information available to would-be migrants from urban centres or from overseas.[80]

The economic effects of mobile phones

According to the Vodafone report, "investment in telecoms generates a growth dividend because the spread of telecommunications reduces costs of interaction, expands market boundaries, and enormously expands information flows."[81] *The Economist* reports, "Plenty of evidence suggests that the mobile phone is the technology with the greatest impact on development."[82] There is significant evidence of a correlation between mobile telephony and economic development – usually measured by growth in Gross Domestic Product (GDP).

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[80] Coyle, 7.
[81] Waverman, Meschi and Fuss, 10.
[82] *The Economist*, "The real digital divide"

There is also anecdotal evidence that mobile phones play an important developmental role from the bottom up, i.e. especially in the marginalised and informal economic sectors of society. This section shall outline the economic effects of mobile telephony, starting with the macro-economic effects and proceeding towards their effects in the informal sector and at the base of the economic pyramid.

Mobile phones and GDP growth

Research on the relationship between fixed-line telephones and economic development reveals a strong correlation between teledensity and GDP. It seems *a priori* evident that because fixed-line telephones are predominant in urban areas, they are "associated with the model of economic development reflected in advancing industrialization and urbanization". However the landline telephone "is not necessarily a cause of industrialization and urbanization" but may rather be a symptom of it. The correlation between fixed-lines and economic development does not necessarily justify a causal relationship, as "one does not know whether telephones influence economic development or economic development influences telephones".[83]

In a study in 1980, Andrew Hardy suspected that if the telephone had an impact on economic development, then it would be largely through the ability of telecommunications to facilitate the organisation of economic activity in and between firms – by improving coordination over increased volumes of businesses, in turn aiding the coordination of activities of interdependent businesses, resulting in increased productivity, and thus economic development.[84] Using cross-sectional data for 60 countries (15 developed countries and 45 developing countries) spanning over 13 years, he analysed the link between fixed-line

[83] Hardy, 278 – 279.
[84] Ibid., 279.

teledensity and economic development, using GDP and energy consumption per capita as a proxy to measure the latter. A strong link was found between telephones and economic development. This link was stronger in developing nations than in developed nations. Nonetheless, Hardy maintained that the telephone was not "a necessary or sufficient cause of economic development", and that telephones did not "guarantee increased economic development either." Rather the telephone was a "facilitating or contributing cause of economic development." [85] Interestingly, the link between business telephones and economic development was not as significant as the link between home telephones and economic development (probably because home telephones are a symptom of a moneyed middle class, and thus it is logical that in countries with higher per-capita incomes more home telephones are present). This may be important for our analysis, because mobile phones in Africa are more commonly personally owned than business-owned, and can fulfill the functions of both. Moreover they are not just a luxury for the middle classes or even those with formal housing and electricity.

The Vodafone report finds that "mobile phones in less developed economies are playing the same crucial role that fixed telephony played in the richer economies in the 1970s and 1980s." Using data on 92 high and low income countries from 1980 to 2003, mobile phones are found to have "a positive and significant impact on economic growth". Furthermore, because mobile phones are a substitute for fixed-lines in poor countries but are a complement to fixed-lines in rich countries, the impact is "twice as large in developing countries compared to developed countries". Between 1996 and 2003, a developing country with 10

[85] Ibid., 279..

more mobile phones per 100 population, would have enjoyed a per-capita GDP growth rate that was 0.59% higher than "an otherwise identical country".[86]

Mobile phones and FDI

Relationships have been found between telecommunications infrastructure and foreign direct investment (FDI). For investors to want to invest in a country, they will want a modern telecommunications network to co-ordinate economic activity. Furthermore, if one does not exist, or if it is severely geographically limited, then investors may not want to invest in the said country. Mobile phones have allowed investors to bypass this previous obstacle to investment.

Examining data for 71 developing countries (32 sub-Saharan countries and 39 other less-developed countries) from 1993 to 2002, the Vodafone report found that there was a significant positive statistical relationship between teledensity and FDI inflows – a 1% increase in fixed-line penetration was associated with 1% to 1.3% higher rates of average FDI. Concerning mobile penetration, it was found that from 2000 to 2002[87], a 1% increase in mobile penetration was associated with a 0.5% to 0.6% increase in FDI. In developing countries as a whole, mobile phones are not as statistically significant as fixed-lines with regard to their effect on FDI. This may be because the fixed-line penetration rate captures other non-telecommunications infrastructures such as roads and railways.

When the analysis is narrowed to only Sub-Saharan African countries, it is found that mobile phones have more of an impact on FDI than fixed-lines – a 1% increase in fixed-line penetration was associated with a 0.6% to 0.9% increase in FDI, whereas in 2002 a 1% increase in mobile subscription yielded a 0.5% to 1% increase in FDI. Thus, increases in

[86] Waverman, Meschi and Fuss, 11.
[87] A significant relationship was not found from 1993 to 1999 because mobile networks had not significantly developed during this period.

mobile penetration appear more significant to FDI in Sub-Saharan African countries, than in other developing countries.[88]

Economic effects of mobile phones at the base of the economic pyramid

According to a telecommunications industry journal "mobile communications is a great enabler. Quite apart from the benefits that it is bringing to the more prosperous areas of the world, it has the potential to transform the lives and prospects of poorer, more remote communities."[89] Mobile phones are having a significant impact on the economy of the continent, and there is a large degree of evidence that this impact is largely from the bottom up; meaning cellphones have had a lot of impact at the base of the economic pyramid and in the informal sector. "We all misread the market", commented Michael Joseph, CEO of Kenyan operator Safaricom. He was referring to how African mobile operators were taken by surprise by the large amounts of subscriber growth. A large proportion of this subscriber growth can be attributed to the phenomenal rate of uptake of mobile phones in the informal economy.[90]

Mobile phones have a symbiotic relationship with the informal sector, and seem perfectly suited to it. Mobile telephony could not have been rolled out so effectively in Africa if it were not for small-scale businesses and local entrepreneurs selling airtime and helping to spread the use of mobile phones. Of the $25 billion dollars of profits earned in the industry in 2005, $2 billion was earned by such entrepreneurs.[91] *The Financial Times* reports on the "umbrella people", entrepreneurs in almost any African city or marketplace who operate and provide mobile cellular payphone services:

[88] Mark Williams, "Mobile Networks and Foreign Direct Investment in developing countries", in *Africa: The Impact of Mobile Phones*, Vodafone ed., Vodafone Policy Paper Series 2, March 2005, 24 – 30.
[89] Micheal Bjärhov, "Mobile against poverty", *Telecommunications International* 4,11 (2006): 34.
[90] Rodrique Ngowi, "Ordinary cellphone becomes tool of commerce in ever-resourceful Africa", *Business Day* 20 September 2005, 2.
[91] Ibid.

> The "umbrella people" are the new face of Nigerian urban life. Their makeshift phone booths have been popping up everywhere. With a small table, a couple of plastic chairs, an umbrella and a mobile phone handset they are ready for business, selling air time by the minute.[92]

The Economist reports, "mobile phones reduce transaction costs, broaden trade networks and substitute for costly physical transport."[93] This is having important effects for informal traders of agricultural commodities. Anecdotal evidence points to the newfound ability of farmers to check the price of a commodity before going to market. Fishermen reportedly use mobile phones to check prices and decide which port to land their catch in.[94] Mobiles make information available fast and cheap, such that a farmer or fisherman can find the best price and decide whether it is worthwhile to go to market. Before mobile telephony, one would have to go all the way to market to do this, often risking lost time, money and produce if nothing was sold. Now mobiles help people get the prices they want for the sale of commodities, and can thus lead to a more efficient market. The "improved flow of information evidently reduces monopsony[95] power in agricultural markets – especially non-commodity markets such as perishable fruits, where prices were not already published in newspapers."[96] Just as the telephone and telegraph led to better incomes for farmers and more efficient markets in the US in the 19th and 20th centuries, this process is now happening in Africa due to mobile phones.[97]

Following such trends in mobile usage, African entrepreneurs have developed systems to enhance the benefits that mobile phones are already bringing to farmers. A Senegalese

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[92] White, 12.
[93] *The Economist*, "Calling across the divide"
[94] This specific example found India but has also been found in Africa on research on fishermen in Mafia Island, Tanzania (Coyle, 7)
[95] A monopsony is a market with one buyer and many sellers.
[96] Coyle, 7.
[97] Ibid.

company called Manobi, which operates online systems for businesses in the developing world, developed a mobile-based trading platform in Senegal for farmers to connect to in order to find out the price of commodities. The system had over 40 000 customers in Senegal by mid 2005, when Manobi was setting up a pilot project in South Africa in Makulele, a community just outside of the Kruger National Park. Farmers can connect to the web-based trading platform by internet-enabled phones or use normal non-internet enabled phones to request prices and make trades via SMS.[98] One of the 100 farmers in the pilot programme said: "I check the prices for the day on my phone and when it's a good price, I sell." Reportedly, the programme has boosted profits for farmers by up to 30%. One farmer claims that his profits have quadrupled as he has been able to cut out the middle-man in the process of selling his stock. Manobi teamed up with Vodacom and French cell phone manufacturer Alcatel to launch the project in South Africa, where it hopes 100 000 farmers will use the system.[99] Another such programme, FoodNet, has been implemented in Uganda using USAID money and South African operator, MTN's network.[100]

Mobile telephony and financial services

Business Day Africa reports on new services that allow users to facilitate money transfers with the use of cellphones. "With the new technology, a grandmother in a rural area can receive money from her son, working hundreds of kilometres away, with the beep of her cellphone."[101] This is an example of the effects of a dual revolution that is happening in Africa – one that involves both mobile and other information technologies like computers and the internet. According to Sean De Cleene of the African Institute of Corporate Citizenship,

[98] Short Message System or "text" message, refers to the ability to send a short text message on a mobile phone.
[99] Reuters, "Selling potatoes via cellphone", *Business Day Africa,* 25 July 2005, 26.
[100] David Christianson, "The shadow economy: mix of tradition and technology", *Business in Africa,* November 2005, 47.
[101] Reuters, "Cellphones help poor with mobile banking", *Business Day Africa,* November 4 2005, 22.

two things are happening simultaneously. Africa is experiencing a mobile phone revolution, and "at the same time, the convergence between information technology and communication technology", has opened up new possibilities – like banking over a mobile phone. Such possibilities are having a positive impact on the integration of the informal African economy into the formal financial services sector. According to David Christianson, a journalist for the magazine *Business in Africa:*

> It may be possible to short-circuit the development of financial services in Africa by making innovative use of contemporary information and communication technology (ICT). If the real reason for Africa's extensive "shadow" economies is the sheer gap between modern financial services and traditional African economic life" then mobile telephony may offer some a lot of opportunities for integrating the gap between financial services and the "unbanked" and the informal economy.[102]

In South Africa, network operator MTN and Standard Bank launched a mobile banking platform that "they hope will bring millions of poor people into the [formal] economy for the first time." This new banking system "replaces a physical bank with a system that uses a patented security mechanism, and requires only a phone call and a government-issued identity number to subscribe." [103] Also in South Africa, "Whizzit", a division of the bank of Athens, has been offering mobile banking services since early 2005. Whizzit allows customers to transfer money, pay accounts and make purchases on their mobile phones. These new systems offer a chance for many for "a first step into a world that can help them save, send and receive money without ever seeing a paper note."[104]

In Zambia and the Democratic Republic of Congo, a mobile company called Celpay, has created a mobile payment system, which enable users to exchange money.

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[102] Christianson.
[103] Reuters, "Cellphones help poor with mobile banking".
[104] Ibid.

> To use the system, one of the two parties involved in the transaction sends the details via text message to Celpay. The company then relays the message to the payer's cellphone, asking him or her to enter a pin code to confirm the transaction. Once confirmed, Celpay arranges the transfer of money between bank accounts. While not entirely replacing banking, this system is useful in a country were carrying cash is dangerous.[105]

Many Africans are trapped in informal economies "where the only medium of exchange is cash. What the new technology may make possible is a direct jump to a cashless economy without any need to go through the same intermediate stages as the developed countries."[106] Now "instead of travelling in taxis and standing in queues for hours, rural people can now do their banking from home – and many are doing just that."[107]

Cellphones have also assisted the organisation of remittances from migrant workers to their families and relatives. According to a World Bank Report, *Global Economic Prospects 2006*, remittances sent by migrant workers to their families in developing countries account for more than $617 billion – more than twice the level of international aid international aid flowing into the developing world. If informal remittances are included, the figure almost doubles. In many countries (like Tonga, Moldova and Lesotho), remittances are the largest source of external capital.[108]

Mobile phones and the political process

On the 19th of September 2003, an estimated 75% of Nigerian mobile phone subscribers turned their phones off as part of a nationwide protest against high tariffs, unfavourable changes in contract terms and conditions, arbitrary reduction of prepaid credit, and poor reception and quality of service. Although on the face of it, this looks like a protest by

[105] Christianson, 47.
[106] Ibid.
[107] Heather Formby, "Buttons beat branches", *Financial Mail*, December 1 2006, 78.
[108] Ethel Hazelhurst, "Transfer cash with you cellphone – anywhere", *Business Report* 16 March 2007.

consumers against mobile operators, Obadare feels that the event signifies "a milestone in the development of oppositional culture in Nigeria" for three reasons. Firstly, it consolidates the democratic opposition's previous use of the radio to mobilise against military rule. Secondly, it represents the continuation of a broader struggle for societal justice. "In a sense, the boycott itself encapsulates a long-standing feud between citizens-as-customers and business corporations in Nigeria", as well as between citizens and the Nigerian state. Thirdly, the protest was representative of the "a new modality of engagement by civil society against the state", opening up a new space for "agitation for both economic and political self-determination in the country". Mobile phones have given civil society a "combined cause and instrument of protest" that "appear to presage the emergence of a new social space of politics and agitation." [109] According to Chairman of the Unofficial Consumers' Protection Agency, Ojemaye Otitoka, "now we are crying against exorbitant GSM tariffs. Tomorrow, using the same methods we will complain about other things".[110]

By the end of 2003, after mobile telephony had been in the country for only two years and there were only 2 million subscribers, there was "no doubt that the introduction of cellular telephony has radically transformed the Nigerian social landscape." Mobile telephony had begun to "manifest simultaneously as both the *subject* and *instrument* of agitation".[111]

Mobile phones and conflict situations

The one area where mobile phones have perhaps not had a positive effect is in the arena of conflict in Africa. More research is needed into the matter to make any conclusions and generalisations. Provided below for are two examples which raise the issue of the role of the mobile phone in conflict situations.

[109] Ebenezer Obadare, "Playing Politics with the Mobile Phone in Nigeria: Civil Society, Big Business and the State", *Review of African Political Economy* 107 (2006): 93 – 94, 104.
[110] Cited in Ibid., 94.
[111] Ibid., 106.

Mobile phones and conflict in the Democratic Republic of Congo

Nowhere in the world has the global boom in mobile telephony had more of a devastating impact than in the DRC. This is due to an important component of mobile phones called *Coltan*. Coltan, or colombite-tantalite, is an ore that contains two elements, Niobium and Tantalum. The latter is an important component of mobile phones, DVD players, computers and gaming consoles. Eighty percent of the world's coltan reserves are found in the Eastern Democratic Republic of Congo (DRC). The UN Panel Of Experts On The Illegal Exploitation Of Natural Resources And Other Forms Of Wealth Of The Democratic Republic Of Congo reported that coltan has had an important role in fuelling the conflict in the DRC. From 1998 to 2001, coltan was the most desired mineral in the DRC. This was due to a spike in the price from $20 a pound to more than $200 a pound. Fortunately, (for the DRC), the market price for the commodity began to crash in 2001. Extraction of coltan has facilitated atrocities in the conflict including the use of child soldiers, child labour and forced labour. [112]

The role of ICTs in conflict, (rather than their mineral components), has not been researched to a large extent. ICTs can be used to facilitate both the prevention and the escalation of conflicts, and it is worth investigating the role of mobile phones here. They could help to facilitate the activities of armed groups, but they could also help to facilitate communications between different armed groups during periods of ceasefire where lack of communication can often be deadly.

There is perhaps some evidence that mobile phones are needed to facilitate the activities of armed forces in a conflict. During the Second Congo War, when the Rwandan backed rebel group, the Rally for Congolese Democracy (RCD [Goma faction]) established a stronghold in the Eastern DRC with the aid of its Rwandan backers, a Rwandan-based mobile

[112] Hari, J. 'The War the World Ignores', *The Sunday Independent*, 14 April 2006, 9.

operator called Supercell began to build a network in the territory occupied by RCD-Goma. Supercell was a subsidiary of Rwandacell, the Rwandan mobile operator – a joint venture between South African mobile operator MTN, Rwandatel (the state-owned fixed-line operator) and Tristar Investments (reportedly established and owned by the Rwandan Patriotic Front).[113] Soon after it was established in 1999, Rwandacell began extending network coverage into Bukavu and Goma in the eastern DRC. By mid 2002 these operations were "formally" acknowledged; Adolphe Onusumba, then the president of RCD-Goma, authorised Supercell to operate in its territory.

Whether this was a corporate or a strategically motivated venture is unknown. Nonetheless, the two Rwandan shareholders were arms of the Rwandan government, which was a provider of political, economy and security support to the RCD. Tristar Investments, aligned with the RPF also co-owned a bank, which funded the RCD and has been accused by the UN of illicit trade in minerals.[114]

Supercell is not reflected in recent company reports, but an internet ICT bulletin says that Supercell, as well as other Rwandan telecommunications operators, still operate in the eastern DRC including Goma and Bukavu.[115]

More research is required into the role of mobile operators in conflict situations. It seems *a priori* however, that there must be utility derived for an occupying force to have control over telecommunications in occupied territories, in order to coordinate the activities of occupation and retain strategic control.

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[113] Rwandacell has since been rebranded as MTN Rwanda.
[114] Stefaans Brummer, "SA's war vultures", *The Mail & Guardian* 16 January 2004.
[115] Balancing Act, "Rwanda, A small country with a desire to succeed", 12 June 2006, http://www.balancingact-africa.com/news/back/balancing-act_309.html

The role of mobile phones in the current Kenyan conflict

A few anecdotes indicate that ICTs do not necessarily play a positive role in conflict situations. In the Rwandan genocide, the radio broadcasts of Radio Télévision Libre des Mille Collines were used to incite and coordinate attacks by Interahamwe militias against Tutsis and moderate Hutus. Unfortunately, the mobile phone may be utilised for similar purposes in conflict situations. Reports indicate that mobile phones appear to be playing an inflammatory role in the current Kenyan conflict sparked by the December 2007 elections. International Committee of the Red Cross in Kenya spokesperson, Bernard Barrett reported that text messages were being used to spread rumours predicting imminent attacks and thus heightening tensions and violence.[116] Whether mobile phones are actually being used to stoke or avoid conflict is debatable, according to a Kenyan *blogger*[117]:

> It's difficult to attach a positive or negative value to these [text] messages collectively. If they're true, then they serve as a useful warning, enabling those who are due to be attacked to protect themselves or to flee. If they're not true, on the other hand, they cause unnecessary panic and might lead to those receiving them planning and executing attacks of their own in order to pre-empt the attack of the perceived enemy... Unfortunately in this current state of unrest, it is difficult to distinguish between fact and falsehood in the flood of text messages filling our phones each day...
>
> [At the extreme] are text messages that are unrepentantly filled with hatred and subversion. These became increasingly more frenetic in the days leading up to last year's general election, and reached a climax after the [Electoral Commission of Kenya] botched up the tallying of votes and a disputed government was hurriedly sworn in. These are the text messages that preach a radical and dangerous message... These are the sometimes hysterical text messages that justify hardline stances and violence...

[116] CNN, "Violence Spreading in Kenya, Red Cross Official Says", January 28 2008, CNN.com, http://edition.cnn.com/2008/WORLD/africa/01/28/kenya.violence/index.html

[117] A blogger is someone who writes regularly in a weblog or blog. A weblog is a personal website in which the author writes regularly.

The mobile phone can be particularly subversive, even more than mass media like radio:

> What makes these subversive messages spread by mobile phone most sinister though, is the ability to select for audience. It is one thing to broadcast subversive messages on radio as was the case in Rwanda...It is an entirely different thing to send these messages to a carefully selected list of people on your contact list who will in turn send them on to their own select list of people so that the message spreads like a virus but catches only people who answer to certain 'characteristics.' [118]

Both the Kenyan Editors Guild, and the Kenyan Union of Journalists, reported receiving death threats via text message. [119] The government responded in a statement by permanent secretary of information and communication, Bitango Ndemo; saying the two mobile operators, Celtel and Safaricom had been requested to assist in the tracing of text messages promoting threat, hatred suspicion and hostility.[120] Allegedly The Kenyan Ministry of Information and Communication has been using Safaricom to discourage and keep tabs on such developments. Safaricom sent a text message warning its subscribers that they would face possible prosecution if they were found to be sending inflammatory messages. There have been concerns that text messaging systems have been infiltrated by security agents, using the networks to monitor and censor citizens.[121]

This chapter of the dissertation has concluded the overview of the effects of mobile telephony with examples of some of the negative impacts of mobile phones. Mobile phones definitely have the possibility of playing a negative role in situations of conflict and political

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[118] R (moniker), "Mobile4Bad", What an African Women Thinks (blog), posted 30 Janurary 2008, http://wherehermadnessresides.blogspot.com/2008/01/mobile4bad.html

[119] Odhiambo Orlale, "We Will Track Down People Sending Hate Messages, Says Information PS", *The Nation* (Nairobi), 31 January 2008, <available: http://allafrica.com/stories/200801310377.html>.

[120] Odhiambo Orlale, "We Will Track Down People Sending Hate Messages, Says Information PS", *The Nation* (Nairobi), 31 January 2008, <available: http://allafrica.com/stories/200801310377.html>.

[121] Kui Kinyanjui, "Safaricom – Our Network Not Censoring Messages", *Business Daily* (Nairobi), 30 January 2008 <available: http://allafrica.com/stories/200801301054.html>.

violence. More research however needs to be done on the matter, before making preliminary conclusions.

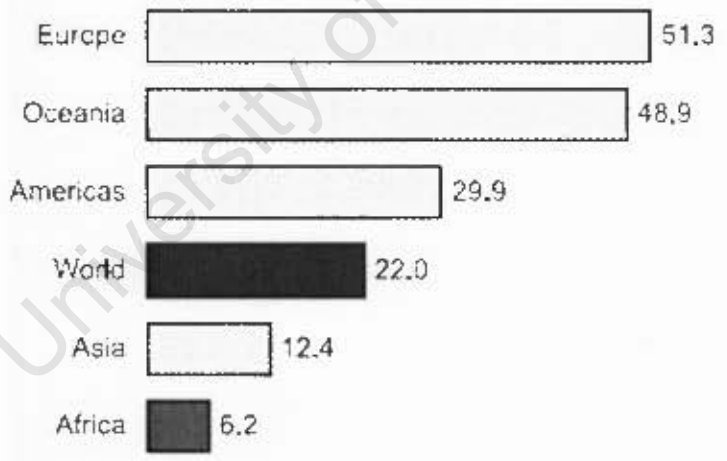
Chapter V – Mobile phones and the digital divide

What is the relationship between mobile telephony and the digital divide? Has the mobile phone bridged a telephony divide between Africa and the rest of the world? Has the mobile phone bridged a divide between Africans with access to telephony and those without?

The mobile telephony divide

As can be seen from the ITU statistics below, there is a large gap between the teledensity of Africa and that of all other regions.

Figure 5.1 World mobile subscribers per 100 inhabitants, 2002-2003



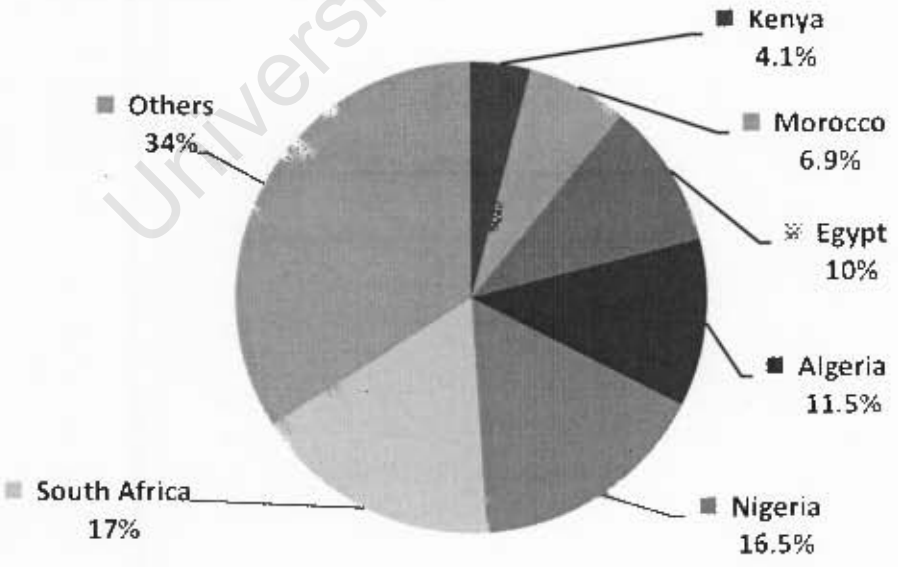
Copied from: Telecommunication Development Bureau. *African Telecommunication Indicators 2004*

Within Africa itself, to a certain extent mobile phones have bridged an urban-rural divide with regards to access to telephony. Whereas during the landline era telecommunications were for urban economic elites, mobile phones are now accessible across income divides, as well as in both urban and rural areas. However, the spread of mobile telephony also seems to

have contributed to the creation of a divide within the continent itself. Mobile phones are disproportionately distributed across the continent. A disproportionate amount of mobile subscriptions are in South Africa and North Africa, Sub-Saharan Africa (excluding South Africa), with the bulk of the population of the continent, is the least connected in terms of mobile telephony. In 1996 South Africa had 82% of mobile subscriptions, whilst Sub-Saharan Africa had only 12%.[122] The situation in 2003 was slightly less skewed, but still vastly disproportionate to population, with the continent's 51.4 million mobile subscribers divided between South Africa (33%), North Africa (32%), and sub-Saharan Africa (35%).[123]

Currently small group of countries make up the bulk of Africa's mobile market and have a disproportionate share of Africa's mobile subscribers. According to a market forecast for 2007, South Africa, Nigeria, Algeria, Egypt, Morocco and Kenya make up a combined 66% of South Africa's mobile subscribers (See figure below).

Figure 5.1 Subscription Market Share forecast – 2007



Reproduced from: Nicholas Norbrook, "Welcome to the permanent revolution", *The Africa Report*, No. 5, January 2007

[122] North Africa 12%, with 67 800 subscribers Telecommunication Development Bureau, *African Telecommunication Indicators 1998*, 36.
[123] Telecommunication Development Bureau, *African Telecommunication Indicators 2004*, A-9.

What of the relationship between mobile phones and the digital divide conceived of in terms of access to the internet? Do mobile phones offer an opportunity to get Africans on the internet? These possibilities shall be investigated in the section below. Firstly, it shall outline how mobile growth has overtaken fixed-line growth and then secondly it shall investigate the effect that mobile phones have had on fixed line growth. Lastly, it shall investigate assertions that mobile phones can be used to bridge the digital divide.

The continuing poverty of fixed-line infrastructure

African mobile phone subscriptions have overtaken total fixed-line subscriptions at a rapid rate (faster than any other region in the world). In 1996 while African mobile teledensity was only 0.16, a significant 7.9% of total telephone subscriptions were mobile subscriptions.[124] By 2000 although mobile teledensity was only 1.98, mobile subscriptions represented 44.2% of all telephone subscriptions.[125] By year-end 2001, African mobile subscriptions (25.8 million) had overtaken landline subscriptions (21.5 million), a year before this happened as a global average (see figure 1.1 in chapter I).[126] Whereas in 1999 only two African countries had more mobile phones than fixed-lines, by 2003 43 countries had more mobile phones than fixed-lines. In 2003, 65.1% of African telephone subscribers were mobile subscribers. In sub-Saharan Africa almost three quarters of telephone subscribers were mobile subscribers[127], the "highest ratio of mobile to total telephone subscribers of any region in the world".[128] Latest estimates from the ITU are that mobile subscriptions in Africa outnumber fixed-lines by nearly seven to one.[129]

[124] Telecommunication Development Bureau, *African Telecommunication Indicators 1998*, 36.
[125] Telecommunication Development Bureau, *African Telecommunication Indicators 2001*, 28.
[126] Telecommunication Development Bureau, "Africa, Telecom projections, 1995 – 2005".
[127] North Africa - 54.1%, South Africa - 73.9% and sub-Saharan Africa excluding South Africa – 72.7%
[128] Telecommunications Development Bureau, *African Telecommunication Indicators 2004*, 4.
[129] International Telecommunication Union, "USD 55 billion committed to connect Africa".

One must be careful of proclaiming that the digital divide is being bridged by mobile telephony. Whilst Africa continues to experience a boom in mobile telephony and the gap between mobile phone usage in the developing world and Africa is closing, Africa remains with very seriously neglected fixed-line infrastructure. Growth rates in mobile telephony have not been matched by similar growth rates in fixed-line telephony. By 2003 the number of fixed-lines had increased to 25.1 million, and fixed-line teledensity was 3.0, compared to a mobile teledensity at the same time of 6.0.[130] Mobile phones subscriptions appear to be growing much faster than fixed-lines. From 1998 to 2003, while the compound average growth rate in mobile subscriptions was 65%, the compound average growth rate of fixed-line subscriptions was only 8.5% and average growth in mainline teledensity was 5.9%. Furthermore growth in fixed-lines appears to be mainly accounted for by growth in North Africa and South Africa. In 2003 sub-Saharan Africa had a fixed-line teledensity of only 0.96 (compared compared to 9.54 in North Africa and 10.66 in South Africa). From 1990 to 2003 the amount of fixed-lines in Sub-Saharan Africa increased from 1.9 million to 6.2 million, this however accounts only for an effective teledensity increase from 0.41 to 0.96 over thirteen years.[131]

African (state-owned) fixed-line operators have not been able to keep up with increased demand for landlines. At year-end 2002 satisfied demand for landlines was 90%.[132] The waiting list for landlines was almost 2.6 million[133], and the average waiting time for installation of a landline in Africa was 4.5 years. As a whole, the waiting list in Africa is decreasing – the compound average growth rate in the waiting list from 1997 to 2002 was -5.5% for Africa as a whole. Nonetheless this decrease reflects decreases in South Africa (-

[130] Telecommunication Development Bureau, *African Telecommunication Indicators 2004,* A3, A-9.
[131] Telecommunications Development Bureau, *African Telecommunication Indicators 1998*; Telecommunications Development Bureau, *African Telecommunication Indicators 2004*.
[132] North Africa 91.6%, South Africa 99.0% and sub-Saharan Africa excluding South Africa 80.4%.
[133] 1.2 million in North Africa, 1.4 million in sub-Saharan Africa and 50 000 in South Africa.

24.5%) and North Africa (-11.5%); whilst in sub-Saharan Africa the waiting list grew at an average annual rate of 3.1%; increasing from 1.2 million in 1997 to 2.6 million in 2002.[134] In summary, growth rates in mobile telephony have not been matched by growth rates in fixed-lines. Whilst demand for fixed lines are increasing, fixed-line operators have not been able to meet increased demand, particularly in Sub-Saharan Africa.

It has been suggested that the reason that mobile phones have so overtaken fixed-lines because they have become a substitute for fixed lines. An ITU report on telecommunications in LDCs offers the following explanations as to why mobile phones might have become substitutes for fixed-lines in LDCs:

- Mobile phones are more easily available than fixed lines because of easy connectivity and deployment of infrastructure, even in rural communities.
- There is a long waiting time for fixed-line connections, which can take up to two years to be established.
- The introduction of prepaid payment systems allows users which may not have previously qualified for monthly subscriptions to use mobile phones.
- In addition, the gradual reduction in mobile call charges due to increased competition.[135]

Evidence seems to point towards mobile phones being complements to fixed-lines in the developed world, whereas they appear to be substitutes for fixed-lines in the developing world. This is not a fixed rule – it seems that mobile phones are sometimes complements and

[134] Telecommunications Development Bureau, *African Telecommunication Indicators 2004*.
[135] International Telecommunication Union, *ICT and Telecommunication in the Least Developed Countries: Mid Term Review for the Decade 2001 – 2010*, (Geneva: International Telecommunication Union, 2006), 9.

sometimes substitutes for fixed-lines in Africa.[136] There is plenty of evidence that mobile telephony has a complementary relationship with fixed-line telephony; "it is not uncommon for calls to be connected between a fixed-line and a mobile telephone, so the services may in fact be complementary to each other". Mobile calls are often made to fixed-lines as opposed to other mobile phones. "In such cases they are used in a complementary fashion as a larger fixed-line penetration increases the value of mobile service." In addition, the high cost of mobile phone calls relative to fixed line calls is unlikely to make mobile phones substitute for fixed-lines. Therefore whether mobile phones are supplements or complements for fixed-lines "is ambiguous, at least at a conceptual level", and "mobile and main-line correlation may be perceived as positive or negative, depending whether they are complements or substitutes."[137] If mobile phones are substituting for fixed-lines, then this implication will have an effect on fixed-line telephony in Africa, possibly resulting in a decrease in expansion and investment in fixed lines.

A reason for the continuing poverty of fixed-line infrastructure compared to mobile infrastructure lies in the government revenues available from the sale of mobile licenses, in contrast to the sale of extra fixed-line licenses. Because governments have focused largely on the former, "the difference between investment levels in mobile communications and other information and communications technology is enormous." [138] This state of affairs has:

> encouraged governments and both private and state owned telecoms companies to cut expenditure on fixed line infrastructure even further. Many observers have welcomed this trend, arguing that the only way sub-Saharan Africa can catch up with the rest of the world technologically is to avoid moving through the same technological phases as

[136] Hamilton.
[137] Ibid., 110 -113.
[138] Neil Ford, "IT development from above", *African Business* August/September 2003, 42 - 43.

industrialised countries and to leap from having very limited fixed line network into developing widespread mobile ownership.[139]

Are fixed-lines still important?

Some analysts do not worry about the effects of mobile phones on fixed-lines, and think that mobile phones are rendering fixed-lines irrelevant. According to the Vodafone report, "in Africa, increasingly telecommunications means mobile telecommunications. Fixed-mobile substitution is not a relevant concept, because the whole developmental stage of widespread fixed line service has been leapfrogged by mobile in many nations." [140]

The term *leapfrogging* is quite popular in literature on the mobile phone. It refers to the possibilities presented by new technologies, for developing countries to skip out certain stages of technological development, and thus reap more of a dividend from the introduction of new technology. The logic behind this is that whereas in developed economies new versions of technology upgrade older versions, in developing countries where these technologies have not yet taken a firm hold, new technologies simply replace old technologies or obviate the need for them in the first place. According to a paper on leapfrogging, "the specific use of IT to accelerate development and promote economic growth is referred to as *technology leapfrogging*: the implementation of a new and up-to-date technology in an application area in which at least the previous version of that technology has not been deployed."[141] Leapfrogging is most commonly used to refer to mobile phones obviating the need for fixed line. The implication in much of the literature is that because

[139] Ibid.
[140] Gough and Grezo, "Introduction" in *Africa: the Impact of Mobile Phones*, Vodafone, ed. The Vodafone Policy Paper Series 2, March 2005, p 2.
[141] Robert Davison, Doug Vogel, Roger Harris and Noel Jones, "Technology Leapfrogging in Developing Countries: An Inevitable Luxury?", *Electronic Journal of Information Systems in Developing Countries* 1,5 (2000): 2. <http://www.ejisdc.org/ojs2/index.php/ejisdc/article/viewFile/5/5>.

mobile phones have leapfrogged the need for fixed-lines. They may in turn leapfrog the need for fixed-lines to connect to the internet.

Mobile vs fixed-line infrastructure as a means of connecting to the internet

It is however debateable whether mobile phones will enable Africans to leapfrog the need for fixed-lines to connect to the internet. Many think that the digital divide cannot effectively be bridged without a focus on fixed-line infrastructure and argue that fixed-lines are still the best option for connecting Africans to the internet.[142] In reality, although the internet can be accessed by mobile technology, bypassing the need for a computer, at the moment internet services on mobile phones in Africa are very expensive and targeted at a niche elite market. Currently fixed-lines broadband connections remain the most effective way to connect to the internet. Too much emphasis on the ability of mobile phones to leapfrog other technologies may be detrimental to the aims of connecting Africans to the internet by leading to further underdevelopment of Africa's already ailing fixed-line infrastructure.

These issues were reflected in an interview conducted by the author with Alison Gilwald, Associate Professor and Researcher Director at the LINK Centre at the University of the Witwatersrand School of Public and Development Management:

> [the rollout of mobile phones] only addressed the voice divide on the continent...In many jurisdictions we don't have third generation[143] or even second-and-a-half generation[144] networks available. People have only got voice services. They certainly couldn't afford to use [data services] even if they had them. In South Africa most of the population people can't afford to use them: HSDPA[145], or ADSL[146] for that matter...The only country

[142] Console Tleane, *The Great Trek North: the Expansion of South African ICT Companies into Africa* (Johannesburg: Freedom of Expression Institute: 2006), ch 1.
[143] High-speed, mobile cellular internet access, also known as "3G".
[144] Low-speed, basic internet-enabled mobile access, also known as "2.5G".
[145] High Speed Download Packet Access – a third generation mobile high-speed internet technology being rolled out currently in South Africa.

> in Sub-Saharan Africa were we could seriously look at broadband in is South Africa – largely explained by the very high GDP per capita's that we have.
>
> ...It does present a real, as you say longer-term challenge in terms of effective participation by consumers in the network economy and the global economy. You need access to the internet. Everybody you speak to from mobile operators to government believe mobile will be the solution, and that it will be able to deliver at least some state of advanced services, like banking services, or other services of that kind. I don't think anyone will be able to surf the web... At the current prices not many people will be able to do that. I think there is a serious policy challenge here; although it may be technologically possible, to see mobile as the total digital divide solution, is very problematic. *It has focused people's attention away from broadband...* Cellphones only go so far under the current environment, certainly many wireless technologies open a lot of opportunities... but they require regulatory foresight.[147]

Between Africa and the rest of the world, there is a very clear and present digital divide with regard to access to the internet. In Africa an estimated 2.6% of Africa's population has access to the internet; this is compared to the Americas (28.2%), Europe (31.1%), Asia (8.1%), and the world average of 13.2%. Of the 158.9 million broadband (high-speed internet) subscribers worldwide, Africa has 0.2% (Americas 30.7%, Europe 27.0%, Asia 41.1% and Oceania 1.1%).[148] A focus on mobile phones needs to accompany a focus on fixed-lines, or the internet access divide cannot be bridged.

[146] Asynchronous Direct Subscriber Line – a high speed internet access technology utilising fixed-lines. ADSL is the most common form of broadband internet connection in the world.
[147] Alison Gilwald. Interview held at the LINK Centre, University of the Witwatersrand, School of Public and Development Management. Johannesburg. 29th April 2008, emphasis added.
[148] International Telecommunication Union, *ICT and Telecommunication in the Least Developed Countries: Mid Term Review for the Decade 2001 – 2010*, 3 – 4.

Conclusion

The growth rates in mobile subscribers witnessed in the African mobile telephony boom have been nothing short of phenomenal. Mobile teledensity has increased from 0.16 in 1995 to approximately 28 at the end of 2007 (while fixed-line teledensity remains around 3).[149] Although the evidence is anecdotal and not consolidated in continent-wide surveys, it seems that mobile telephony has had a tremendous impact on African life in the social, economic and political spheres. It has been shown that the mobile phone has had a significant impact on economic development (for which GDP and FDI were used as a proxy for measurement). At the macroeconomic level, statistical studies have shown a correlation between mobile teledensity and GDP growth, as well as between teledensity and FDI. It is hard to determine whether these statistical correlations mean that the mobile phone is a symptom or a cause of economic development. Considerations should take cognisance of the fact that the boom in mobile telephony has overlapped with the occurrence of a global commodities boom[150], which has had a significant and positive impact on GDP for many African economies. Nonetheless, a number of factors may discount mobile phones as being merely an indicator of GDP or economic growth, rather than a cause of it.

- The relatively low costs of mobile phone usage in comparison to the benefits derived from mobile phone usage.
- Mobile telephony has provided significantly lower economic barriers to entry such that mobile phones cannot be considered as merely the tool of an urban economic elite.

[149] Telecommunication Development Bureau, *African Telecommunication Indicators* (2004, 2008). The 2007 teledensity figure is calculated according to projections for subscribership at year-end 2007 (International Telecommunication Union, "USD 55 billion committed to connect Africa") and using a population estimate of 941 million.

[150] Which now at the time of writing with the ensuing global credit crunch may turn out to be a bubble.

- Furthermore, the way in which mobile phones are shared in Africa further reduces the cost of access.

It has been showed that mobile phones are used to a large extent by those in the informal economy as well as by those at the base of the economic pyramid. Anecdotes have also shown that the mobile phone, through the provision of financial services, may help to integrate those in the informal economy into the formal realm of economic activity. Furthermore, the true extent of the developmental effects of mobile phones may be hidden from most macroeconomic analyses. The significant effects that mobile phones are having on the informal economy will not be directly captured by indicators of economic development, which measure the formal economy and its macroeconomic variables. The symbiosis between mobile phones and the formal economy points to mobile telephony being a tool to promote economic development from the bottom up, in contrast to most attempts at economic development, which are top down.

Mobile phones are also having effects on political developments. These effects are often positive, with mobiles aiding democratic practices and advocacy initiatives. The Nigerian example shows that the mobile phone can be used positively in the political process. However, the examples of Kenya and the DRC show however that in the realms of politics and conflict, mobile phones they are not necessarily a positive tool, nor politically neutral in all circumstances. Further research needs to be done on the use mobile phones to effect positive political change, and to avoid their negative effects in the political process and conflict situations.

It is the author's contention that there is still much to be done in terms of rolling out mobile phone technology and making it affordable and accessible to low-income and underserviced areas. Due to the unequal distribution of mobile subscribership as enumerated

above, it is possible that mobile phones could have even more impact, and more should be done to encourage their proliferation. In addition, not only do mobile phones need to be rolled out; their positive effects at the base of the economic pyramid and in the informal economy need to be encouraged. Mobile operators as well as governments and the private sector need to work towards further innovative ways to use mobile phones to integrate those in low-income groups and the informal economy into the realm of formal economic life.

The digital divide (conceived of in mobile teledensity) between Africa and the rest of the world does seem to have narrowed with the introduction of mobile phones. However, divides within Africa at regional, national and sub-national levels still seem to be very prevalent. It is important to note that Africa has not made much progress in terms of the digital divide of access to the internet in comparison to the developed world, and much more progress must be made on this front. Large divides exist within Africa concerning access to the internet. In countries where there is internet access, large sub-national divides are prevalent and internet access seems to be still restricted to largely urban areas.

If mobile phones are seen as functionally equivalent, and as substitutes for fixed lines, then one could argue that, in terms of teledensity the digital divide between Africa and the rest of the world has narrowed to a significant degree. However mobile phones are *not* functionally equivalent to fixed lines, especially in terms of the ability of mobile to facilitate connection to the internet. This technology is not feasible and affordable in its current state, and mobile phones are not currently a viable solution for connection to the internet. Mobile phones have not leapfrogged the need for fixed-lines. In fact, there is a danger that mobile phones could have a negative effect on the development of fixed-line infrastructure by diverting expenditure away from fixed-line investment. This dissertation has outlined the continued impoverishment of fixed-line infrastructure, which is unable to keep up with the demand presented for it.

Notwithstanding this, the reader should bear in mind which has more of an impact on everyday African life; mobile phones, or the internet? The author holds that mobile phones have had much more of an impact.

From the evidence presented it seems that mobile phones are truly changing the way Africa works and, are changing it to the large extent for the better. What is the future of this revolution? Can its rates of growth be sustained? In 2006, mobile teledensity was 22.[151] This means that somewhere near 22% of Africans have mobile phones, and far more have access to mobile phones. Is there further potential for growth, bearing in mind that over 40% of Sub-Saharan Africans are living on under $1 per day?[152] Will markets not become saturated and the corporate players lose interest in a market where, due to its extreme growth, the average revenue per user is decreasing? Alternatively, does this mean that ICT-based investments and development initiatives may start to focus on computers and the internet, rather than just on mobile phones? What is the hope of further deepening the dividends of the mobile revolution and perhaps starting to focus now on the broader information revolution and digital divide?

There seems to be a strong corporate and political will towards a vision of bridging the digital divide and incorporating Africa into the global information economy and society. This was reflected at a two-day summit[153] in Kigali in October 2007, entitled *Connect Africa,* organised by the International Telecommunication Union, the African Union and the World Bank. At the summit commitments were made to:

- interconnect all African capitals and major cities with ICT broadband infrastructure, and strengthen connectivity to the rest of the world by 2012;
- extend broadband and ICT services to all African villages by 2015;

[151] International Telecommunication Union, *Telecommunication/ICT Markets and Trends* in Africa 2007 (Geneva: International Telecommunication Union, 2007), 2.
[152] World Bank, African Development Indicators 2007 (World Bank Group: 2007).
[153] 29th – 30th of October.

- and to meet the goals of the World Summit on the Information Society for capacity building, establishing an enabling environment for investment, and e-government services.[154]

In addition, hefty cash commitments were also made. The GSM Association announced that it would double investments in sub-Saharan Africa's mobile phone industry to over US$50-billion in the next five years, in order to expand and upgrade networks and provide coverage to over 90% of the population. The World Bank announced at the summit that it would double its current $1-billion commitment to private sector ICT investments in Africa by 2012. The African Development Bank announced that it would increase its investments in ICT infrastructure in the next three years, and that it had committed close to US$65 million to the building of submarine cables to create broadband links between Africa and the rest of the world. The European Commission announced commitments to support "trans-African networks that facilitate interconnectivity" through the establishment of a trust fund by the European Investment Bank and ten European Union member states that would "finance cross-border projects or national projects with a regional and continental impact that would include ICT." The fund includes almost €100 million in grants and €260 million in loans for the period 2007-2008, and is to be "substantially replenished by the end of 2008". The Commission also announced a commitment of €6 million to support regulatory reforms in Africa.[155]

Africa's fixed-line and broadband infrastructure, which (as highlighted above) has taken a back seat to mobile telephony, was also a priority at the summit. According to the ITU, "success in mobile penetration is now set to be emulated in broadband connectivity in Africa, with new investment foreseen for ICT infrastructure." The ITU's Secretary-General

[154] International Telecommunication Union, "USD 55 billion committed to connect Africa".
[155] Ibid.

Hamadoun Touré said that such investment would be essential to achieving the UN's MDGs and that "this new investment in ICT infrastructure will lead to new jobs and overall economic growth".[156]

Sha Zukang, Under-Secretary-General of the UN Department of Economic and Social Affairs, stated he was "confident that with the entrepreneurial spirit of the African private sector working with their international partners, the support of the international community and the commitment from governments, universal connectivity in Africa is no longer a utopian dream."[157] However, the role of governments in overseeing the harmonization of regulatory frameworks, to provide an enabling environment for these goals, is essential. Rwandan President Paul Kagame said at the conference, "In order to realize this much-needed economic revolution, we have to forge productive relationships between government and business". This view was also espoused by Craig Barrett, the Chairman of the Intel Corporation, and the UN Global Alliance for Information and Communication Technologies and Development, who stated "this is not a technology problem — the technology is waiting to be deployed" and that "we now need the government priorities, decisions, and policies to drive the implementation of a pan-African infrastructure."[158]

[156] Ibid.
[157] Ibid.
[158] Ibid.

Acronyms used

CAGR – Compound Average Growth Rate

DRC – Democratic Republic of Congo

FDI – Foreign Direct Investment

GDP – Gross Domestic Product

GSM – Global Systems for Mobile communication

ICTs – Information and Communication Technologies

IT – Information Technology

ITU – International Telecommunication Union

LDC – Least Developed Country

NWICO – New World Information and Communication Order

RCD – Rally for Congolese Democracy

SIM Card – Subscriber Identity Module Card

SMS – Short Message Service

UN – United Nations

US – United States

USAID – United States Agency for International Development

US – United States

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Note on online sources

The author feels that including the date a site was last accessed is a cumbersome and unnecessary convention. The author has to the best of his knowledge not cited any online source believed unavailable at the time of the completion of the dissertation. All internet links herein were accessed in order to verify that they were still available online in their original state on the 5th of February 2008.

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